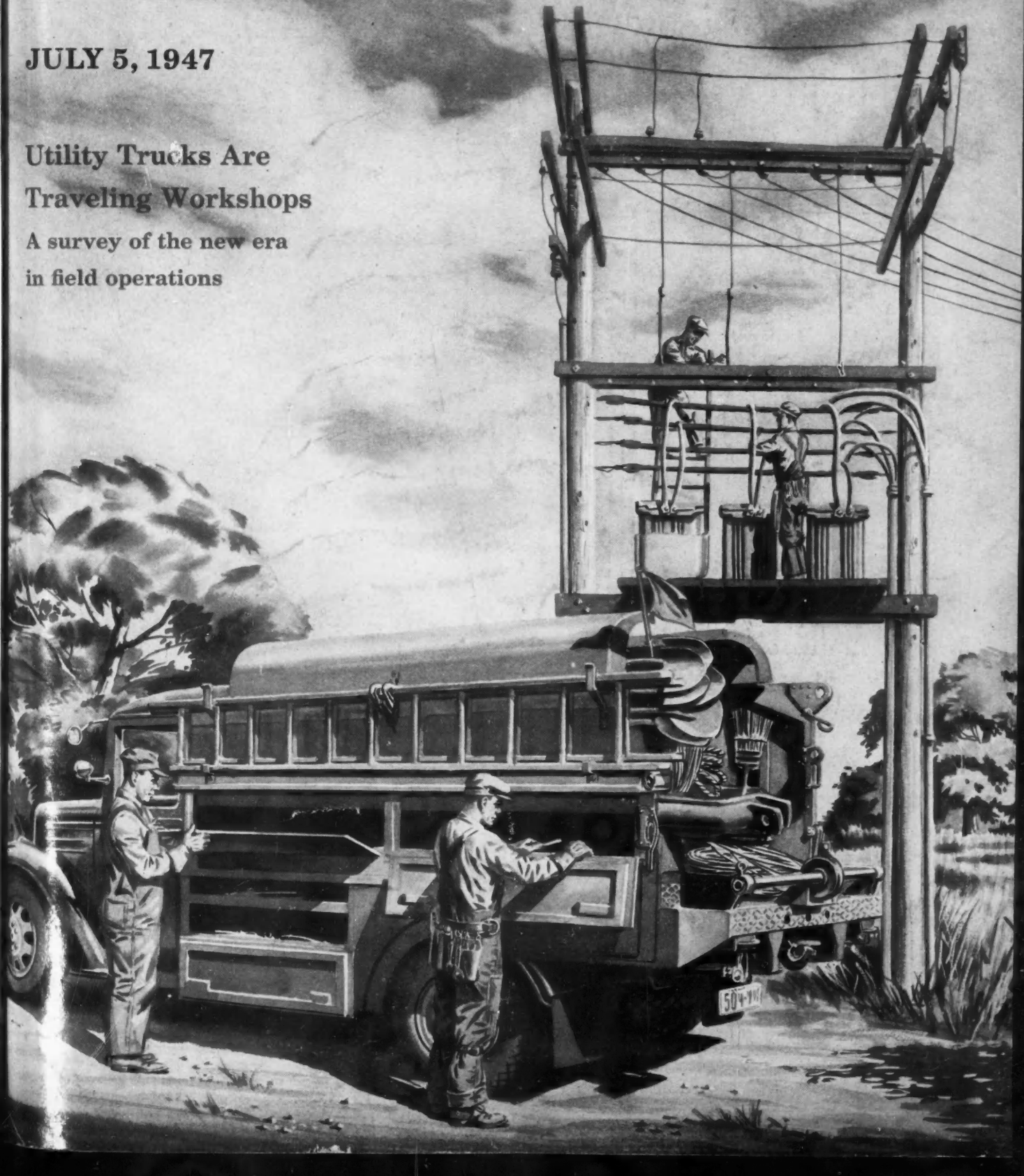
Electrical World

A McGRAW-HILL PUBLICATION

JULY 5, 1947

Utility Trucks Are Traveling Workshops

A survey of the new era in field operations



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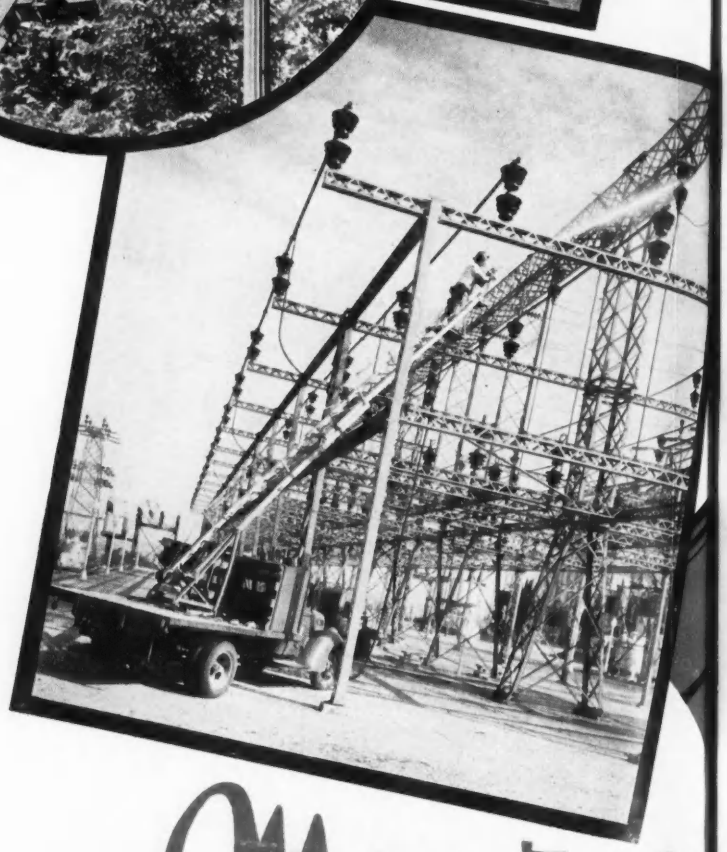

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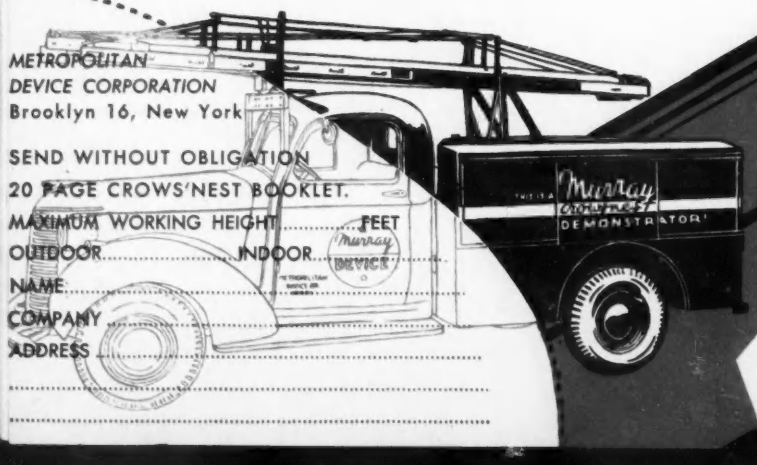

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Electrical World

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July 5, 1947 — Vol. 128, No. 1

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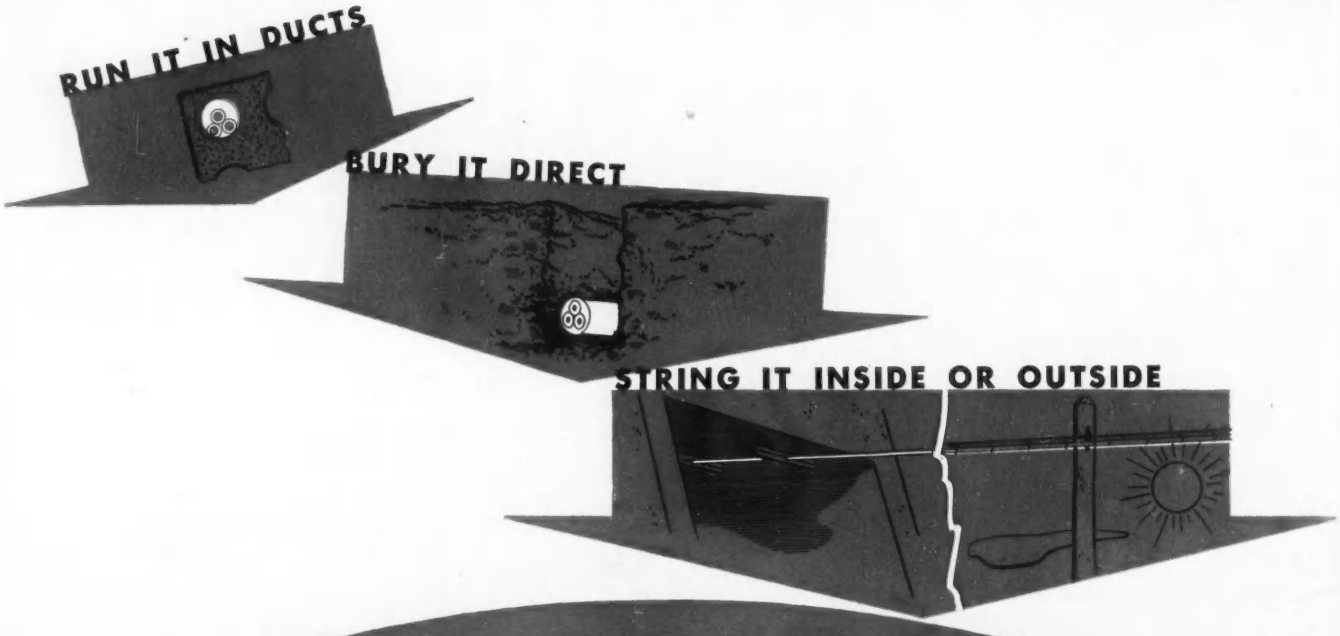

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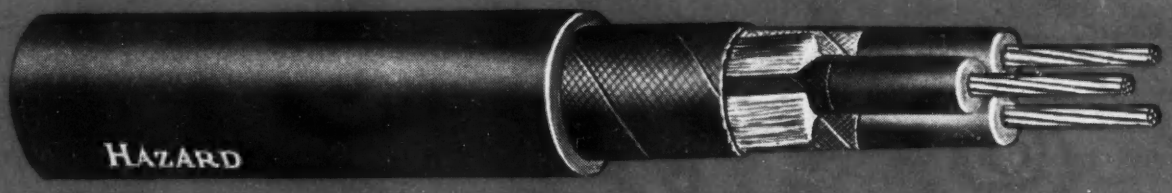

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Electrical World

JULY 5, 1947

Only the First Step

PERIODICALLY for more than a year, ELECTRICAL WORLD has examined the increasing flow of legislation aimed at softening the impact of labor disputes on the public. Many of these laws have been aimed specifically at the electric power and related public service industries. Most of them have employed devices which we believed were less than the best ways of cushioning effects of public service strikes.

Now the Taft-Hartley bill has become the law, with vastly broader jurisdiction than any of the numerous state laws and presenting a vastly broader program for handling labor disputes.

One of its perils, we feel, will be found in any tendency which management may show toward relaxing, toward considering that the law itself will settle labor problems. Obviously, no law, however perfect, can substitute for good relations between management and employees. Much of the act, indeed, is designed to apply primarily after good relations have proved non-existent or insufficiently strong to handle what problems arise. Above all, let no one consider that labor problems are finished, or will be resolved automatically, just because we have a new law.

The Taft-Hartley Act is beneficial in certain very real ways. For one thing, speaking broadly, it does take the first step down the road to correcting what the 1946 record demonstrated to be an impossible situation. In addition, by withdrawing any recognition of foremen as employees under the meaning of the act, the law frees management from having to bargain with itself. This can only be a gain, even though under it, the foremen conceivably might become the most militant of all employees.

The new law's treatment of professional employees—who are particularly vital to the electrical industry—shows a net gain. Now, they may decide for themselves, by secret ballot, whether or not they want to be in the same bargaining unit as other employees. This will permit men who have put extra effort into preparation for a working life to realize the benefits the training can bring them, unhampered by seniority promotion, or by restrictive, make-work regulations. Even so, the new law does not remove their right to union representation.

Another plus in the Taft-Hartley Act is its recognition of the fundamental human truth that not all evil or all good necessarily rests with one side. Henceforth, unions will find themselves required to live up to a statutory moral code in the form of specified unfair practices, just as management is still required to do and has been for a dozen years.

ELECTRICAL WORLD can say little for the law's plan to protect the public health and welfare. It is cumbersome. It seeks to outlast, rather than settle affirmatively, a labor dispute imperiling the public. We continue to prefer the program for electric utilities we advanced editorially last October 26. This maintained certain standards of wages, hours and working conditions, with arbitration of any disputes over departure from these standards.

Probably no one but the legal profession will be entirely happy with the Taft-Hartley Act. Its pitfalls for management are no less present than are those for contemporary union practice. But it is a first step down a road which had to be travelled.

★ ★ NEWS OF THE

Hydro Plants Safe; Atomic Power Far Away, Lilienthal

AEC Chairman Advises Rep. Horan That Hydro Installations in the Columbia Basin Will not Be Obsolete in 10 Years—First Atomic Plants to Go Where Coal and Water Are Scarce

PRODUCTION of electric energy from atomic power plants is "unlikely" to develop so rapidly as to render obsolete federal hydroelectric generating facilities in the Columbia Basin, according to Chairman David E. Lilienthal of the Atomic Energy Commission.

Further, the AEC executive reported, the first plants producing electric power from nuclear piles on a commercial basis probably will be located in areas where coal is scarce or costly, or where low-cost hydro energy is unavailable. They will not compete with existing generating facilities.

The Lilienthal statements were written in response to Rep. Walt Horan of Washington, who had expressed concern over what he termed as rumors to the effect that within ten years, "atomic energy will be producing electricity more cheaply than either steam or hydroelectric plants" and that, therefore, it would be "senseless" to build any further dams across the Columbia River.

In reply, Chairman Lilienthal said:

"The questions which you have raised about the time required for the development of atomic power to the point where it is a major competitor with other sources of electrical power are difficult to answer in detail.

"We have no doubt that the long-range future of atomic power is bright but believe the process will, in general, be one of gradually supplementing rather than replacing other means of generating electrical power.

"It is very likely that the first commercial installations for atomic power will be in locations with inadequate access to coal and economical water power.

"As to the particular question you put, while it is not prudent to make firm predictions about the rate of development in an industry which is so new, we believe it unlikely that atomic power presents any serious question of rendering obsolete Columbia River power within the predictable future."

Rep. Horan made public the Lilienthal statement in the course of introducing a bill to establish a "Columbia Interstate Commission," which would take over the development of water and other resources of the Pacific Northwest. Insisting that CIC would not be a "Valley Authority," the Washington legislator urged its organization to "undertake the planning, promotion and operation" of federal development of the Columbia Basin.

The Horan bill would set up CIC as a federal corporation, with headquarters in the Northwest. The agency would be headed by a five-man commission, appointed by the President, with four members to be nominated by the governors of Washington, Oregon, Idaho, and Montana. This board would be assisted by a 33-member advisory council, composed of representatives of those four states and Wyoming.

The need for such an organization has been emphasized by local criticism of the development programs now being carried forward in the region by Bonneville Power Administration, the Bureau of Reclamation and other federal agencies, Rep. Horan asserted.

Taft-Hartley Act Article Next Week

A special article, prepared by the Washington Bureau of the McGraw-Hill Publishing Co., explaining the effect of the Taft-Hartley Act on the electrical industry will appear in next week's *Electrical World*.

SEC Handling of Holding Company Act Challenged

The Securities and Exchange Commission may be called upon the Congressional carpet in the near future to defend its administration of the Public Utility Holding Company Act of 1935. Rep. Hugh D. Scott, Jr., author of two bills amending the act, is pressing for an investigation along these lines by the House Interstate and Foreign Commerce Committee, and there is some indication that he will be successful.

The Pennsylvania Republican said that his attention had been called to SEC's interpretation of the act by the commission's current proceedings against the Philadelphia Co. of Pittsburgh.

"SEC is attempting to dissolve the Philadelphia Co. largely upon the basis of its control of the Pittsburgh and West Virginia Gas Co., a West Virginia corporation," Rep. Scott explained. "The commission apparently has given little or no consideration to the fact that the subsidiary sells most of its gas output to the Philadelphia Co. and that this arrangement results in substantial economies to gas consumers in Pennsylvania."

The Scott bills would amend Sections 2, 3, and 11 of the act to prevent SEC from ordering divestment by a utility holding company of gas properties, which "directly or indirectly, furnish or sell gas" to associated companies. They also would forbid indiscriminate separation of gas and electric properties on the basis that the gas operations of a holding company bore no "functional relationship" to other operations of the parent company.

Rep. Scott said that he expected committee hearings on his bills within "two or three weeks" Citing the record compiled by the committee last year during hearings on legislation proposed by former Rep. Lyle Boren, he added that he saw no need for lengthy discussion of SEC's activities in connection with his own bills.

•

50-Year Franchise Granted

Gillespie, Ill., has granted the Illinois Power Co. a 50-year franchise.

GROUND BREAKERS—Leaning on their souvenir shovels this group of municipal officials, business leaders, newspapermen, and officials of the Mississippi Power & Light Co. poses for a picture following the ground breaking ceremonies at the site of the 30,000-kw. Rex I. Brown plant which will be erected north of Jackson

Robinson Suggests Agency to Replace 'Temporary' BPA

CONGRESS was urged last week to enact legislation which would set up a "permanent administration" to replace the Bonneville Power Administration and take over from BPA its "temporary duties" in connection with marketing federal power in the Pacific Northwest.

This plea was made by Kinsey M. Robinson, president of the Washington Water Power Co., while testifying before the House Public Works committee in behalf of the Dondero Bill. Noting that the bill exempts the Northwest in proposing to end the Interior Department's control over power produced by Army-built hydro plants, Robinson then referred to an almost forgotten provision of the Bonneville Project Act of 1937.

Administration Is Provisional

Section 2 (a) of the Act, he recalled, says: "the form of administration herein established for the Bonneville Project is intended to be provisional pending the establishment of a permanent administration for Bonneville and other projects in the Columbia River Basin."

Thus, the utility executive pointed out, the Bonneville Administration markets Grand Coulee power "as a result of a Presidential edict and not as a result of any specific legislation passed by Congress. More recently, the McNary and Hungry Horse projects have been included under BPA marketing plans by administrative order of the Secretary of Interior."

He protested existing extensions of BPA's transmission lines "beyond the Columbia River Basin" and "voluminous advance plans" of the agency for "much greater extension" of its lines without prior approval by Congress. He also objected to Bonneville's "uncontrolled rate-contract policies," which, he observed, also had not received legislative sanction of Congress.

In establishing a "permanent" power marketing agency for the Northwest, Congress should set up an independent body—responsible only to Congress—to transmit energy from Columbia River generating stations to the principal load centers in Oregon and Washington, he suggested.

The territorial limits of the marketing agency should be specifically limited to a definite area, preferably Washington and Oregon. The agency's rates and contracts should be subject to "complete regulation" by the Federal Power Commission—"just like any other interstate utility system."

A new agency, with instruction from Congress as to its "scope, limits, privileges and duties," would "enable a proper and orderly plan to be set up for future power plants in the area," he concluded. "Such plants should be so designed and located, and be so scheduled for development as to meet the needs of the territory. All utilities —federal, municipal, power districts, and business-managed taxpaying companies—would then be in position to cooperate fully to insure abundant power for all at the lowest possible cost."

Power Plants Come First

The British government has given electric power plants first call on the nation's annual steel supply of about 13,000,000 tons. In order the others on the priority list are coal mining machinery and equipment, gas plants and equipment, coal and oil conversion equipment, railway equipment, and atomic energy plants. No allotments have been set, but priority users can have all the steel that they need within reason.

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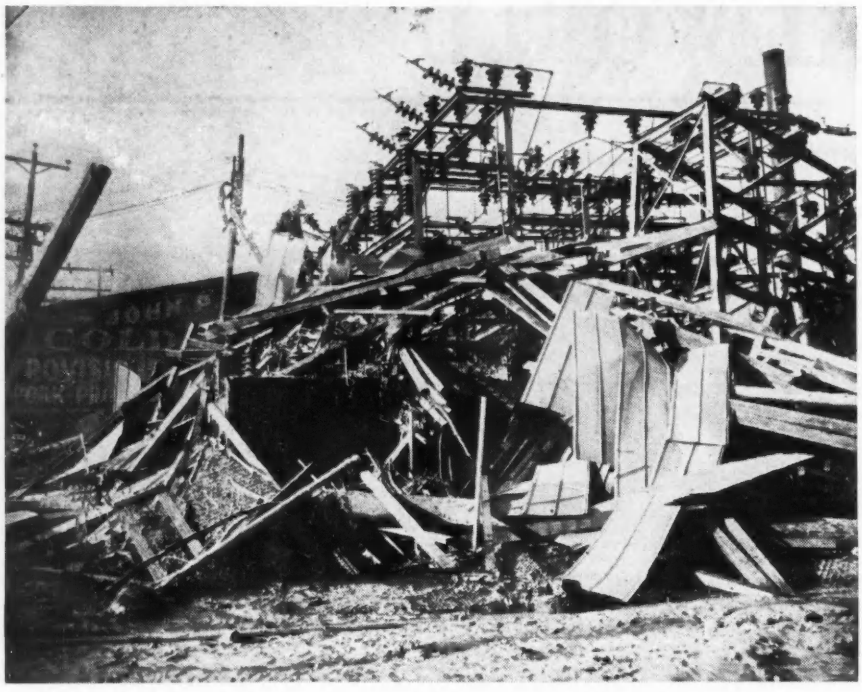
Utilities Back Research

Three business-managed electric utilities operating in Idaho have established an annual grant of $7,500 to finance a farm-electrification research program at the University of Idaho. The utilities are Idaho Power Co., Washington Water Power Co., and Utah Power & Light Co.



A JOB AHEAD—Workmen removing flood-water debris from the Cleveland Ave. substation of the Central Vermont Public Service Corp. at Rutland, Vt.

Central Vermont President Reveals Restoration Plans

Announcing that it will cost Central Vermont Public Service Corp. $1,105,000 to replace and restore service to its properties damaged in the June 3 flood, President Albert A. Cree, in a letter to stockholders, revealed complete details of the damage done and of the reconstruction steps being taken.

The four plants on East Creek, which were damaged by the flood, had a capacity of 7,600 kw. of these, the 3,600-kw. Pittsford plant, the largest, was damaged but slightly, and its generators are being run as condensers for voltage correction purposes. Glen station, of 2,000-kw. capacity, was only slightly damaged but was filled with silt and debris. Conditions were similar at the 400-kw. Patch plant. These three plants are to be restored to service, but none can be operated until penstocks are repaired, and the Chittenden dam at the head of the creek can be drained, repaired, and refilled.

The 1,600-kw. Mendon plant was so badly damaged that present plans indicate that it will be abandoned.

Considerable damage was also done to the Cleveland Ave. gas plant, garage, operating office, service department, and indoor and outdoor electric substation. The electric facilities will be rebuilt, but the gas system will be changed from water gas to propane-air gas.

It is estimated that the flood will increase net operating expense and interest cost in 1947 by $309,000.

Beauty Must Give Way to Utility

Despite strong objections, the Labor government in England has announced that it will proceed with its plans to extend the Bankside power station of the London City Electricity Co. on the south bank of the Thames opposite St. Paul's cathedral. Opponents protest that the plant will threaten the historical dominance of the area by the cathedral and will mar proposed plans to beautify the south bank. See picture on the centerspread of the March 8 issue of *Electrical World*.

Power for the Indians

In order to get electric service for their homes, the Yavapai Indians, a small tribe living on a reservation near Prescott, Ariz., have voted to waive any damage to their lands resulting from power lines which will be erected by the Arizona Power Co.

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R. S. Wallace Honored

The East Peoria station of Central Illinois Light Co. has been renamed the R. S. Wallace station in honor of the former chairman of the board.

Texas Legislature Passes 9 Laws Restricting Unions

Interruption of Utility Service Less Likely Under Law Barring Mass Picketing, Worker Coercion

Electrical utilities and manufacturers are affected by nine union-curbing laws passed during the recent session of the Texas Legislature.

Most popular of the laws was one to protect electric, gas, and water utilities against interruption of service. Even pro-labor legislators favored this law which grew out of a strike over a year ago against the Lower Colorado River Authority, which interrupted service to 250,000 Texans and resulted in considerable sabotage of equipment.

The law allows workers to walk out but forbids picketing which would interfere with other workers getting to their jobs or intimidation of those who want to work. The district courts can enjoin actual or prospective deeds which would interrupt service. Persons guilty of damaging utility property during a labor dispute either willfully or through neglect are liable to penitentiary sentences of two to five years. Those who conspire to damage utility property are equally guilty with those who actually commit the sabotage.

Two laws place unions under both civil and criminal anti-monopoly regulations.

Other laws:

Make unions financially responsible for damages caused by members participating in illegal strikes.

Prohibit any deduction, including union dues, from a worker's pay without his written consent.

Restrict picketing to two pickets for each 25 ft. around a plant where a labor dispute is in progress and forbids acts which would prevent a non-striker from entering the plant.

Prohibit the closed shop.

Make it a misdemeanor to participate in secondary or sympathy strikes or boycotts.

Forbid any state or local government agency to bargain collectively with employees. Under this law, employee organizations are permitted, but any employee who strikes is subject to automatic dismissal with loss of all seniority and other benefits.

•

Jacksonville Votes Funds

Voters of Jacksonville, Fla., have approved by 4 to 1 the issuance of $15,000,000 in certificates of indebtedness for extensions and improvements to the municipal electric system, which is in a rundown condition.

Army Engineers Lose Only Small Portion of Civil Funds

House Committee Cuts Appropriations $43,540,231 but Bulk Comes from Rivers and Harbors and Flood Control Projects —Money Allowed Will Permit Continuance of Hydro Projects

PREDICTIONS of drastic slashes in funds for the Army Engineers' 1948 Rivers and Harbors and Flood Control programs failed to materialize in House committee action last week on the annual appropriation bill for the War Department's Civil Functions.

The committee trimmed the total money in the bill 11.3 percent below the budget estimate, from $382,727,100 to $339,186,896. The bulk of this reduction—$38,148,600 of the total cut of $43,540,231—was taken out of estimates for the Engineers' work on flood control and rivers and harbors projects. But the committee slash left a total of $252,713,500 to be spent by the Engineers on these two programs during the coming fiscal year.

Funds Will Continue Construction

Most of the Engineers' budget estimates for projects involving major hydroelectric generating facilities were reduced by the committee. But no funds had been asked for any entirely new projects, and the amounts approved will permit continued construction on all going developments.

Construction of major power projects under the Flood Control program was provided for as indicated in the following table:

Reservoir	Budget Estimate	Committee Recommendation
Allatoona, Ga.	$7,425,000	$6,572,100
Buggs Island, Va.	4,800,000	3,800,000
Bull Shoals, Ark. ...	3,694,000	3,000,000
Clark Hill, Ga.	6,075,000	1,481,000
Center Hill, Tenn. ..	5,703,000	5,703,000
Dale Hollow, Tenn...	900,000	900,000
Fort Gibson, Okla. ..	6,000,000	4,700,000
Fort Randall, S. D...	6,500,000	5,000,000*
Garrison, N. D.	13,000,000	6,500,000
Narrows, Ark.	2,061,500	1,761,500
Whitney, Tex.	5,700,000	4,625,000
Wolf Creek, Ky.	6,800,000	4,000,000

*Includes $850,000 for plans and specifications only for Oahe Reservoir, S. D.

The committee also recommended a similar reduction in expenditures for rivers and harbors. Most important power-producing project affected by this cut was McNary Dam, a unit of the Engineers' Columbia River project. Construction funds for work on the Columbia development were reduced from the estimate of $3,500,000 to $3,000,000.

Most significant reduction ordered by the committee was the $4,594,000 slash in the estimate for construction of Clark Hill dam. During hearings on the measure, representatives of the Engineers discussed the offers of the Savannah River Electric Co. to build this project in its entirety or to install and operate the power facilities at the site. The budget estimate for Clark Hill, they said, included no funds for power installations.

Several members of the committte urged that the federal government accept one of the company's offers, pointing out that enabling legislation had been brought before the House Public Works Committee. Army spokesmen conceded that the company could operate the power plant "as well" as the Engineers could.

Funds for advanced planning also were reduced, in line with previous House action on public works appropriations. The budget estimate of $2,500,000 for advanced planning of rivers and harbors projects was cut in half, as was the $4,000,000 item sought for flood control plans and specifications.

House Group Okays Weak Version of Rockwell Bill

After four months of controversy, a House Public Lands subcommittee last week approved a watered-down version of the Rockwell Bill. But chances that the measure would reach the House floor during this session still were slim, since the chairman of the full committee, Rep. Richard J. Welch, California, was openly hostile.

Originally designed to effect sweeping reforms in the amortization provisions of federal reclamation law (ELECTRICAL WORLD, February 22, Page 3), the Rockwell Bill was a mere shadow of its former self when it emerged from the subcommittee. However, it retained language carrying out one of its major objectives, which was to upset a ruling by a former Interior Department solicitor on repayment requirements of the 1939 Reclamation Project Act.

The solicitor's ruling, in effect, permitted amortization of the federal investment in power facilities of reclamation projects through the repayment of interest only. It also allowed the application of this interest component to repayment of the costs of irrigation. Both these concepts are rejected by the subcommittee draft of the Rockwell Bill, which provides for direct repayment to the Treasury of the power costs from power revenues, plus interest thereon.

But several provisions softening the

A GOOD PUBLIC POWER REPORT—S. J. Wilhoite, left, chairman of the Electric Power Board of Chattanooga, receives from Don Berning, Fort Wayne Municipal System, the American Public Power Association Award for having the best annual report. The presentation was made at the recent association convention

NEW ENGLAND METERMEN—These 54 metermen from Connecticut have completed the course given recently at the Connecticut Light & Power Co. at Waterbury. The course was sponsored by the New England Meter Engineers

impact of this clause were added by the subcommittee. Among these were amendments of the Reclamation Act which: (1) increase the repayment period to 67 years, instead of "a reasonable period," generally accepted by Interior as a maximum of 50 years heretofore; (2) decrease the interest payable on the power investment from 3 to 2 percent; (3) permit the allocation of expenditures for salinity control, fish and wild life conservation, and recreational facilities as non-reimbursable costs.

•

House Subcommittee Will Rewrite Both Miller Bills

The two Miller bills, aimed at extensive revision of the Federal Power Act, will come in for considerable rewriting at the hands of the House subcommittee now considering them.

Sources close to the subcommittee, a unit of the Interstate and Foreign Commerce Committee, predicted this week that the measures "in some form" would be reported to the House in the near future. Members of the committee are reportedly favorable toward "the objectives" of the bills, but wish to "button up" certain "loopholes" which they contain.

Hearings on the bills continued Wednesday with the Federal Power Commission testifying in opposition. The FPC witnesses had been scheduled to appear last week, but the committee deferred the hearings.

Utilities Will not Bargain Collectively with Foremen

Relying on the new Taft-Hartley labor law, Potomac Electric Power Co. will continue to ignore a recent National Labor Relations Board order directing it to bargain collectively with its foremen and other supervisors, it was learned this week from PEPCO's personnel office.

The new law's denial of bargaining rights to "supervise" may also have some bearing on whether Virginia Electric & Power Co. renews its one-year foreman contract effective since March 1 with the International Brotherhood of Electrical Workers, A.F.L.

Both sides understood that VEPCO would reconsider its bargaining relations with the 180 first-grade foremen next March in the light of court decisions and any new laws. T. J. Moore, VEPCO general counsel, told ELECTRICAL WORLD, he did not know what position the company would take at that time. The I.B.E.W. also represents VEPCO's 1,800 production and maintenance workers.

PEPCO definitely will not bargain with the Electric Utility Foremen's Association, independent, which NLRB certified as bargaining agent for assistant general foremen, assistant foremen, chief operators, watch engineers and assistants, administrative clerks, storekeepers and assistant stock supervisors.

The Taft-Hartley law expressly defines a "supervisor" and includes some classifications heretofore considered by NLRB as non-supervisory. It says "supervisors" do not have the status of "employees" under this law. Thus, they do not have its protection nor are they subject to any of its restrictions or penalties.

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Washington Condemnation Ruling Reversed by Court

Reversing a previous decision of the court as to the proper method of review of decrees of public use and necessity in condemnation cases brought by cities and public utility districts, the Washington State Supreme Court ruled recently that the Clark County P.U.D. must justify to the court the action of the lower court in ruling that the district had a right to condemn property of the Northwestern Electric Co.

Since 1906, the court had ruled that in condemnation cases brought by cities and P.U.D.'s a decision on the granting of a decree of public use and necessity may not be reviewed until after final judgment in the condemnation case is rendered, at which time an appeal can take to the upper court any part of the case, including the decree of public use and necessity.

Now if the P.U.D. is successful in justifying action of the lower court, the case will then be returned to the lower court for trial of the amount of compensation to be paid to the company. Under previous procedure, the trial on compensation was completed in the superior court before high court appeal.

NLRB Follows Taft-Hartley Act in Detroit Edison Ruling

Refuses to Disestablish Independent Union Which Got Start with Company Help—Decision Is Sharp Break with Precedent and Anticipates Provisions of New Law not yet Effective

THE Nation Labor Relations Board in the past several months has shifted its policies in the direction Congress was heading. Now the board has made another shift. For the first time in many years, NLRB refused last week to disestablish an independent union which got its start with company help.

This decision, involving some 425 employees in the Customers Service Division of Detroit Edison Co., is in accord with the Taft-Hartley Act, which is not effective in NLRB matters until August 22.

A complaint against NLRB has been that it always ordered an independent union broken up whenever it was found to have had company assistance. This was not always true of locals affiliated with national unions. Now, the Taft-Hartley law specifies that NLRB, in deciding questions of company domination of a union, shall apply the same rules irrespective whether the union is affiliated with a national organization.

The three board members split in as many ways in finding that the Detroit Edison Employees Association had been tainted by company assistance but need not be dissolved because the company has conducted itself satisfactorily since 1944. At that time the Customers Service Division Club, started in 1942 and given the same clubhouse and social benefits accorded a score of other company clubs, became the Detroit Edison Employees Association for collective bargaining purposes.

NLRB member James J. Reynolds, Jr., held that the club was strictly social and that the company did not dominate a "union."

Chairman Paul M. Herzog and John M. Houston agreed that the company, in aiding the club, contributed to the support of its successor, the association. They disagreed as to the remedy. Houston, as in past cases, wanted the association dissolved.

Herzog, injecting some of the ideas contained in the new law, did not feel that it was necessary to kill the association in order to preserve for the workers their freedom of union choice. Disestablishment of a union, he said, is a "drastic remedy which has been employed with insufficient discrimination."

Doubting that such a remedy is "invariably necessary" in every case, Herzog added, significantly:

"This is 1947, not 1935; in the interim employees have learned much about protecting their own rights and making their own choices with the full facts before them."

In the company's favor were these facts: It declined the use of a meeting room or any other assistance after the social club was converted into a union in 1944. It told the association to get NLRB certification before it would bargain with it, which the association did not do. The company has ten bargaining contracts with the Utility Workers, C.I.O.; two with the International Brotherhood of Electrical Workers, A.F.L., and one with an independent union in the Customers Accounts Division.

The board dismissed the C.I.O. utility workers' complaint insofar as it alleged that the company interfered with the employees' right of self-organization. The company was ordered, however, not to recognize the association as bargaining agent unless and until it is certified by NLRB.

This means that, if an election covering these workers is held on petition of the C.I.O., the Independent union, not having been disestablished, could be allowed a place on the ballot if it intervened.

THE VICE-PRESIDENT EXPLAINS—An employee of the Utah Power & Light Co. may supplement his retirement income with an annuity by authorizing a monthly payroll deduction of $10, Adam S. Bennion, vice-president, explains at the first of a series of company-wide dinners

Harrington Wimberly Now Vice-Chairman of FPC

Continuing its philosophical swing from the left to just right of center, the Federal Power Commission has elected Commissioner Harrington Wimberly, moderate Oklahoma Democrat, as its vice-chairman.

Wimberly succeeds former Vice-Chairman Richard Sachse, who retired recently because of failing health. Sachse and former Chairman Leland Olds, still a member, were considered the most "liberal" members of the commission. Chairman Nelson Lee Smith, who succeeded Olds last year, is listed, together with Commissioners Wimberly and Draper, as a member of FPC's moderate group.

Appointed in October, 1945, Wimberly is filling the unexpired term of former Chairman Basil Manly, who resigned. His term expires in June, 1948. The new vice-chairman is owner of a daily newspaper in Oklahoma.

P.U.D.'s Still Seeking Puget Sound Utility Properties

Public utility districts in Washington have not yet given up their attempts to purchase the properties of Puget Sound Power & Light Co. despite the recent decision of the State Supreme Court that a proposed purchase by the Skagit P.U.D. would be illegal (ELECTRICAL WORLD, June 21, Page 48).

Guy C. Myers, fiscal agent for the districts involved in the deal, and Bert L. Heggen, president of Skagit, revealed this week that a statewide cooperative to buy and redistribute the utility properties to the districts is being considered.

However, there is still time to seek a rehearing of the case or to appeal it to the U. S. Supreme Court.

The decision may lead also to the purchase of part of the utility's properties by Seattle, although it is more likely that the city will wait until 1952 when Puget Sound's franchise will expire. City Council is already on record as opposing the renewal.

Frank McLaughlin, Puget Sound president, in a letter to stockholders, held out hope that other methods would be found to sell the properties at a fair price. Pointing out the difficulties of competing against subsidized public power competition, he said that it is best for stockholders and the public to sell the system in one piece so as to keep it intact.

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Profits from TVA Power Must Benefit Consumers

Municipalities and cooperatives availing themselves of Tennessee Valley Authority power contracts must abide by the provisions that any profits in resale of power must be used to reduce rates or improve the system. Such was the ruling of Federal Judge George C. Taylor in the case brought by TVA to enjoin Lenoir City, Tenn., from using surplus power revenues to retire some general refunding bonds.

TVA officials hold the ruling of far-reaching signifiance to every power consumer in the Tennessee Valley area. TVA General Counsel Joseph G. Swidler termed the decision as of utmost importance, for it gives assurance to the consumer that any profits from resale of TVA power will be passed on in the form of lower rates and not diverted to other purposes.

Lenoir City passed an ordinanee in 1941 authorizing the issuance of bonds to retire indebtedness incurred for general municipal purposes and at the same time pledged revenues derived from sale of TVA power to pay off the bonds. The court upheld the TVA contract which in effect sustained the validity of contracts with 92 municipalities and 47 cooperatives. The judge ruled that if the purchaser takes TVA power it must abide by conditions of the contract.

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Budget Cut Forces BPA to Close Wenatchee Office

The Bonneville Power Administration north central district at Wenatchee, Wash., closed on July 1, with personnel scheduled to be either discharged or transferred.

The district, composed of Grant, Chelan, Douglas. Okanogan and Kittitas Counties, will be absorbed by other districts of the Bonneville field organization. L. J. Bauer has been acting manager at Wenatchee.

Some 200 BPA employees were released July 1, about 10 percent of the 2,053-man staff, W. A. Dittmer, acting administrator, reported. He said the step was "a precautionary measure taken in view of the drastic reduction in the Bonneville budget initiated by the House of Representatives."

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State Unit Authorized

The Colorado River Commission has authorized the construction of a Nevada-owned generator of 80,000-kw. maximum capacity at Hoover Dam. The Bureau of Reclamation will order the generator, and the state will repay the cost, estimated at between $6,000,000 and $7,000.000, from sale of power produced by the unit over a 20-year period.

MEETINGS

American Society of Mechanical Engineers—Fall Meeting, Hotel Utah, Salt Lake City, September 1-4. Ernest Hartford, executive assistant secretary, 29 W. 39th St., New York 17, N. Y.

Illuminating Engineering Society—Technical Conference, Roosevelt Hotel, New Orleans, September 15 to 19. A. D. Hinckley, executive secretary, 51 Madison Ave., New York 10, N. Y.

Indiana Electric Association—Annual Convention, French Lick Springs Hotel, French Lick, Ind., September 17-19. E. F. Hauser, executive secretary, 1414 Circle Tower, Indianapolis, Ind.

National Farm Electrification Conference—Claypool Hotel, Indianapolis, October 7-8. Russell Gingles, secretary, 155 E. 44th St., New York 17, N. Y.

Previously Listed

American Institute of Electrical Engineers—Pacific General Meeting, San Diego Hotel, San Diego, Calif., Aug. 26-29.

SEC RULINGS

The Securities and Exchange Commission recently issued a series of orders affecting electric utility companies.

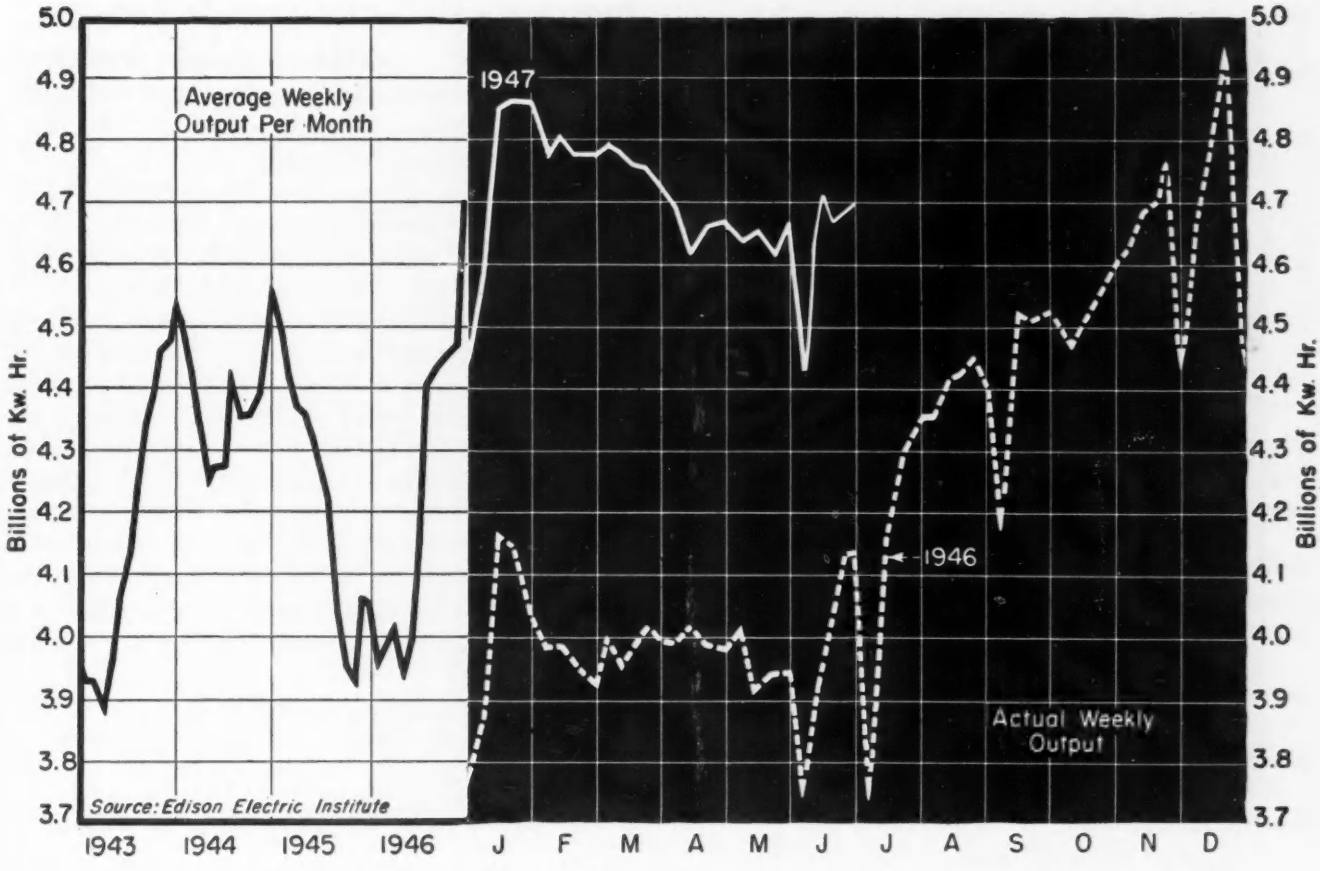
NORTH AMERICAN LIGHT & POWER Co's petition to use $1,391,818 of segregated funds representing interest on debentures held by its parent, the North American Co., toward a settlement payment to Illinois Power Co., its subsidiary, has been granted. The payment is in connection with settlement of $11,300,000 in claims which Light & Power owes Illinois. (Release No. 7446).

AMERICAN GAS & ELECTRIC Co.'s request for an extension until August 5 of the time within which it must dispose of 522,416 shares of the $10-par-value common stock of Atlantic City Electric Co. has been granted. (Release No. 7480).

WASHINGTON RAILWAY & ELECTRIC Co.'s Section 11 (E) plan has been endorsed by the commission as "fair and equitable" to all parties. Purpose of the plan was to facilitate compliance with a five-year old order of the commission regarding Washington Railway's parent, the North American Co., and various companies in the latter's holding company system. It provides for the eventual dissolution of Washington Railway and its sub-holding company, the Washington & Rockville Railway Co. of Montgomery County; of Great Falls Power Co., whose land and water rights will be acquired by the Potomac Electric Power Co., a subsidiary of Washington Railway. Under the approved program Washington Railway will dispose of its interest in the Capital Transit Co. and will use the proceeds to redeem $2,800,000 of bank loans. In overruling the objections of stockholders the commission found that the alternatives suggested by them involved complications not encountered in the company's plan. (Release No. 7410).

CENTRAL ILLINOIS LIGHT Co.'s application for permission to make certain changes in its charter and by-laws has been approved. Under provisions of the sanctioned program, which had the approval of Commonwealth & Southern Corp., Central's parent, the subsidiary will: (1) Increase its common stock from 250,000 shares without par value to 1,500,000 shares; (2) Change its outstanding common, all owned by Commonwealth, from 210,000 shares into 800,000 shares, and (3) Increase the aggregate common stock stated capital from $10,833,-988 to $13,600,000 by the transfer of $2,-766,012 from earned surplus to the common stock capital account. (Release No. 7459).

NORTH AMERICAN Co.'s proposal to distributed in partial liquidation to its common stockholders shares of common stock of Wisconsin Electric Power Co. has been approved. On July 15 North American will distribute two and a half shares of Wisconsin common for each 100 shares of North American common held on June 12, and in October North American proposes to distribute five shares of Wisconsin common for each 100 shares of North American held. The latter distribution, however, may not be made until the commission considers the basis of a cash distribution in lieu of fractional shares of Wisconsin. (Release No. 7461).



Nevada Group Seeking Power from Shasta Dam

Negotiations are under way between the Bureau of Reclamation and Nevada's Colorado River Commission for the purchase by the state of 90,000 kw. of Shasta Dam power.

In a statement issued from the Bureau's regional office at Sacramento, Calif., it was revealed that engineering studies were being initiated preparatory to drawing up a contract.

Just when power could be delivered to Nevada by the Bureau was not clear, with Congress slowing down on appropriations for transmission lines in the Central Valley project. It is understood that Nevada does not contemplate the financing of lines necessary for carrying out any contract.

According to Bureau spokesmen, there are no customers in sight for the major part of the 450,000 kw. that will be available when installations at Shasta and nearby Keswick are completed in about a year. This contention is in sharp contrast to statements given before the Senate Appropriations Committee recently by J. B. Black, Pacific Gas & Electric's president, when he said his company is willing to purchase all the power the Bureau can produce in California.

Although the Bureau has in the past mentioned threatening power shortages in California, it was pointed out that the delivery of Shasta power to northern Nevada would relieve P.G.&E. of the necessity of selling to the Sierra Pacific Power Co., Reno, as it now does. The Bureau believes this power would be available to customers in California areas served by the P.G.&E. system.

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Court Upholds Validity of Tax on Bottled Gas

Circuit Judge Charles A. Carroll has upheld the validity of a city utility tax imposed on bottled gas. The action was brought against the city of Coral Gables, Fla., by several bottled gas companies contending a 1945 legislative act authorizing municipalities to tax utilities did not apply to them because they do not hold public utility franchisees.

The suit was brought by Southeastern Natural Gas Corp., Gas-Oil Products, Miami Bottled Gas Co. and Brook Gas Co., all Florida corporations, and by Carbon & Carbide Chemical Corp., of New York.

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Theodore D. Crocker Dies

Theodore D. Crocker, president and general manager of the Northern States Power Co., Minneapolis, died on June 29 in that city after a short illness. He was 66 years old.

Electric Output Dips

The electric output curve turned downward during the week ended June 28, 1947, according to figures released by the Edison Electric Institute. The amount of electrical energy distributed by the light and power companies of the country amounted to 4,674,748,000 kw.-hr., comparing with 4,676,300,000 kw.-hr. during the preceding week. During the week ended June 29, 1946, the amount of electrical energy distributed totaled 4,132,680,000 kw.-hr., this year's figure representing an increase of 13.1 percent. For the preceding week the over-all gain for the country was 13.3 percent.

Weekly Output, Millions Kw.-Hr.

1947		1946		1945	
June 28	4,675	June 29	4,133	June 30	4,353
June 21	4,676	June 22	4,129	June 23	4,358
June 14	4,702	June 15	4,030	June 16	4,348
June 7	4,635	June 8	3,920	June 9	4,327
May 31	4,429	June 1	3,741	June 2	4,304
May 24	4,663	May 25	3,942	May 26	4,330
May 17	4,616	May 18	3,939	May 19	4,377
May 10	4,653	May 11	3,911	May 12	4,302
May 3	4,640	May 4	4,012	May 5	4,397
Apr. 26	4,668	Apr. 27	3,977	Apr. 28	4,416
Apr. 19	4,660	Apr. 20	3,987	Apr. 21	4,411
Apr. 12	4,620	Apr. 13	4,015	Apr. 14	4,332

Percent Change from Previous Year

	June 28	June 21	June 14
New England	+ 6.6	+ 6.6	+ 7.3
Mid-Atlantic	+ 6.2	+ 7.1	+10.3
Central Industrial	+12.8	+12.8	+16.4
West Central	+11.2	+11.7	+12.8
Southern States	+16.1	+16.5	+24.2
Rocky Mountain	+18.5	+16.8	+17.8
Pacific Coast	+19.5	+18.9	+18.5
Total United States.	+13.1	+13.3	+16.7

Electrical World
OPINION

Nipping Incipient Faults

FOR 20 years or more, the Germans have used gas-pressure relays to sound an alarm or trip off a large transformer whenever the gas pressure above the oil exceeds predetermined levels. Thus they catch insulation failures before they proceed to the point of wholesale destruction of the transformer or disastrous fire or explosion. The basic type was known as the Bucholz form.

No very extensive use has been made of the device in the United States, but application has grown steadily in Canada, where some 600 have been applied since 1939 to transformers ranging from 667 to 50,000 kva. Experience there seems not to bear out the objections raised south of the border when gas-pressure relays were first advocated.

Those objections were that the device was supercritical, that there was no good place to install it on the transformer, that the price at the time carried prohibitive royalties, that each device and each installation had to be subjected to thorough test before complete dependence could be placed on them. The Canadians seem not to be deterred by any of these objections but, on the contrary, report saving many transformers that probably would not have been rescued by differential protection alone. Up north, they test the gases to see if they have come from disintegration of the oil by corona or incipient breakdown. If their fears are confirmed, they consider that they have averted a serious interruption or disturbance and credit the avoidance to the gas-pressure relay. A metropolitan company is said to be using a mass spectrometer to identify the gases.

American ears perked up when they heard this recited recently at Montreal. What could revive interest to a really responsive level would be (1) a gas-pressure relay not prone to be trigger-happy, (2) a rugged device, (3) a good place to put it on transformers, (4) a simple but positive means to tell quickly whether the excess gas came from the locally overheated oil. If priced right and built right, the pair might catch some of the not so new transformers before they wreck themselves and precipitate an outage, particularly in this period when equipment and service are both at a premium.

Housewife Martyrs versus Appliances

SOME WOMEN resent electric appliances. True housewives, who like housework and little else, deem these devices competitors. Even when they use them, these women suspect electric appliances.

This is a root of sales resistance, according to Dr. Ernest Dichter, addressing the recent Marketing Conference of the American Management Association. It parallels the opinion Miss Caroline Haslett, head of the Electrical Association for Women, a British organization, expressed during a visit to this country. Miss Haslett said English women were not too enthusiastic about some electrical "gadgets" found in American homes.

Undoubtedly, the woman to whom housework is a major reason for existence will regard any mitigation of it as threatening her position. Such feeling, otherwise expressed, finds outlet in many excuses—"Can't afford it;" "the old way suits me best;" "always getting out of order"—these are some objections of the woman who sees her job whittled down and her importance in the home reduced.

Perhaps there are many women who find real satisfaction in the moral position they think they gain from the drudgery of housework. But daughter is less likely to feel that way than mother, who in turn enjoys the martyrdom complex less than grandmother did. Thus, with the new generations, that resistance to labor saving appliances will dwindle. The picture of the bride, ecstatic over her gleaming electric range and dish-washer, is certainly the right one for advertising.

Banker Promotion of Appliance Sales

"THERE is enough money in the banks to finance all of the farm and home electrical equipment that can soundly be bought." So stated Robert M. Berkeley, vice-president of the Bank of Virginia, at a recent meeting of electrical wholesalers and distributors in Richmond. Further, said Mr. Berkeley, if dealers fail to make "package" sales, grouping into single financing transactions all the appliances and facilities that electrified farms and homes can use, then they will have fumbled the opportunity offered by the present available money supply and by the present desire for appliances.

It is on such evidences of banker interest as this that forward-looking utilities—Pennsylvania Power & Light is one that comes immediately to mind—again are urging local bankers not only to finance appliance sales but also to join actively in their promotion.

This idea of banker participation in appliance sales promotion was developed quite effectively in some places before the war. Banks displayed appliances, sent out mailing pieces, advertised, and, in some instances, hired men especially for such promotional work.

To build residential and farm electrification to the levels so freely predicted for them in coming years will

require the combined effort of everyone concerned. Bringing the banker back into the promotion picture is essential to its success.

Profits from Good Employee Relations

FOR some time, ELECTRICAL WORLD has been asserting the interdependence of good employee relations and good labor relations. Recently, we noted the activities of the Monsanto Chemical Co. immediately following the disaster at its Texas City plant, and praised them as indicative of the nature of good employee relations. Since then we have discovered another example of mighty good employee relations, which is paying off today.

Back in the darkest of the depression days, an Eastern manufacturer had sufficient business to keep his plant open; but, for various reasons, he was unable to meet his payroll easily. At one point, he kept things going by promising certain of his key men that if they would continue on the job under conditions which all admitted were deplorable, he would, when it became possible, split the divided profits with them dollar for dollar. Every dollar paid in dividends, he promised, would be matched with a profit-sharing dollar. Some of his men worked for nothing for as long as four months.

Ultimately, profits reappeared, and the dollar-for-dollar split began. It is carried on today at the same rate, although, actually, certain aspects of the formula for sharing the profits raise the ratio slightly in excess of dollar for dollar—to the benefit of the employees, not the stockholders.

Some time back, the wage increase pattern for that industry made it appear necessary for that management to give a 12-cents-per-hour increase. Philosophically, management was appalled, feeling that its prices were already too high, and that the utilitarian thing to do would be to cut prices and hold wages rather than raising each. It took its concern to the employees—along with a 12-cent wage boost. It made its position unmistakeable—and awarded the raise. In giving it, management asked that the workers do their best to support the company in a step which it proposed to institute concurrently with the wage boost—a price cut of 10 percent. The first month of increased wages and decreased prices brought that company its best month in history as regards shipments and profits.

This is not to argue, of course, that every employer in the land can solve his labor problems overnight by a dollar-for-dollar division of the profits and by cutting prices every time he grants a wage increase. It is to point out that where confidence, respect, fair dealing and sympathetic appreciation of another's problems are worked at, a response may be expected. These attributes are the foundations of good employee relations. They do yield a profit for those who will work at them for more than just a little time.

WASHINGTON COMMENT

By R. N. LARKIN

THOSE who expect a panacea for public service strikes in the Taft-Hartley Act will be surprised to study Section 206, dealing with strikes imperiling the national health and safety. This section looks less promising than some state laws.

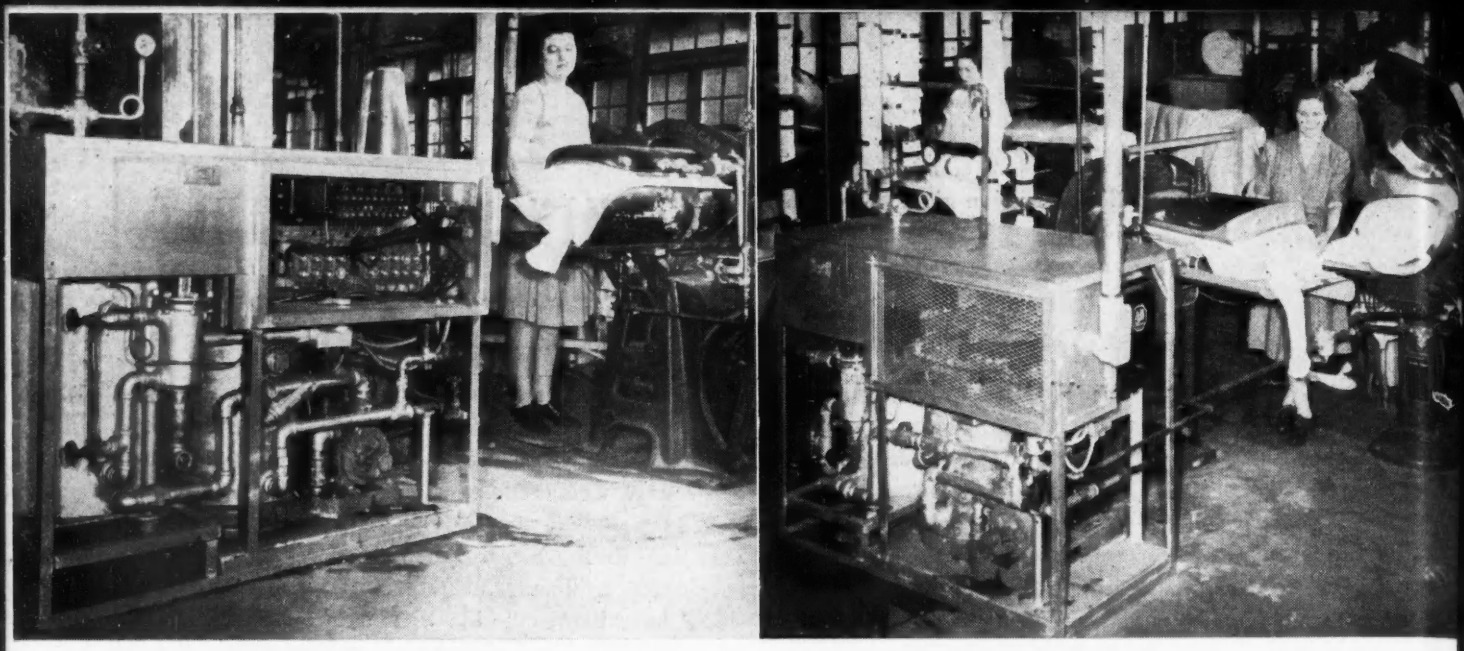
Fitting Section 206 to last fall's power strike in Pittsburgh gives a gloomy prospect. First, President Truman would have had to decide whether the Duquesne Light Co.—and perhaps its interconnected partners—was an entire industry or a substantial part of an industry. It would not be much less difficult to determine whether a metropolitan power strike imperiled the "national health and safety." Obviously, the strike imperiled Pittsburgh; but without a showing that Duquesne powered a manufacturer of some vital product nowhere else available to the nation, would it imperil "national health and safety"?

One might argue that Duquesne is in fact a local enterprise, whose labor problems should be regulated by the state. Presently, the federal government has asserted jurisdiction successfully over numerous utilities. Application of the new law may be disputed, with settlement reserved for the courts.

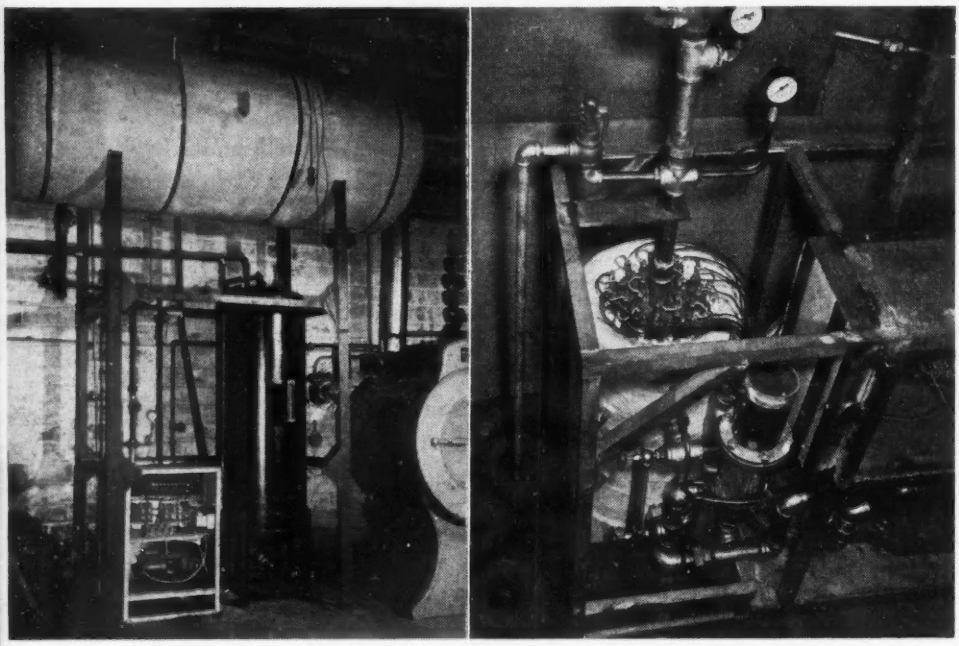
Suppose, then, the President determined a Duquesne strike to be actionable under the Taft-Hartley Act. Assume it was handled under Section 206 up to the point at which a U. S. District Court was asked to issue an injunction. Before the court could issue such an order, it would have to find that the strike actually threatened an "entire industry or a substantial part thereof," and that the "national health and safety" was in peril. These are the same standards the President must satisfy; but there is no guarantee that a District Court would agree with the President's legal reasoning. Courts have been second-guessing Presidents for years, ahead of and behind national opinion.

But to get on with it, let us suppose that the court issues such an injunction. Some time will have been consumed in the appointment of the board of inquiry required by this program, and still more by the board in preparing its report. Thereafter, the President and the Attorney General will need time to study the report and decide whether to seek an injunction. Finally, the court will require some time to reach its decision. Assume that each of these five steps required a bare 48 hours. That would be ten days. Only two power strikes in recent years lasted so long. This device, thus, is no hair-trigger remedy for public service strikes.

There are other flaws. The injunction is effective for only 80 days if issued. It merely requires the disputants to try to settle it, a duty borne at all times by any group calling itself a public service organization.



STEAM GENERATORS IN ALL-ELECTRIC LAUNDRY. 45-kw. unit at left supplies twelve flatwork garment presses and heats office. Similar unit at right supplies ten presses, starch cooker and soap tank



ELECTRIC WATER HEATING INSTALLATION, showing 600-gal. tank at top, 24-kw. steam generator, and heat exchanger (black tank); 1,500 gal. of hot water is furnished daily . . . Close-up of 54-kw. steam boiler on five-roll flatwork ironer (right), showing upper terminals of 1,500-watt heating elements and compactness of boiler

America's

AN ALL-ELECTRIC laundry has been the utility power salesman's dream for years, but the competitive Btu. was always his difficulty. Now, there is at least one all-electric laundry in the United States—the first so far as known—to blaze the trail for others. This is the New Broadway Laundry in Portland, Ore., served by the Northwestern Electric Co.

Three important factors resulted in this 192-kw. installation. First, the enthusiasm of A. S. Brown, the owner; development of a satisfactory electric steam generator; and a favorable electric heating rate.

Heating of the large quantities of wash water, always the most serious stumbling block in laundry electrification, was solved by the same type of electric steam generator used throughout the plant for steam generation for presses and mangles. There are five of these generators in the laundry, totaling 192 kw.

Hot Water

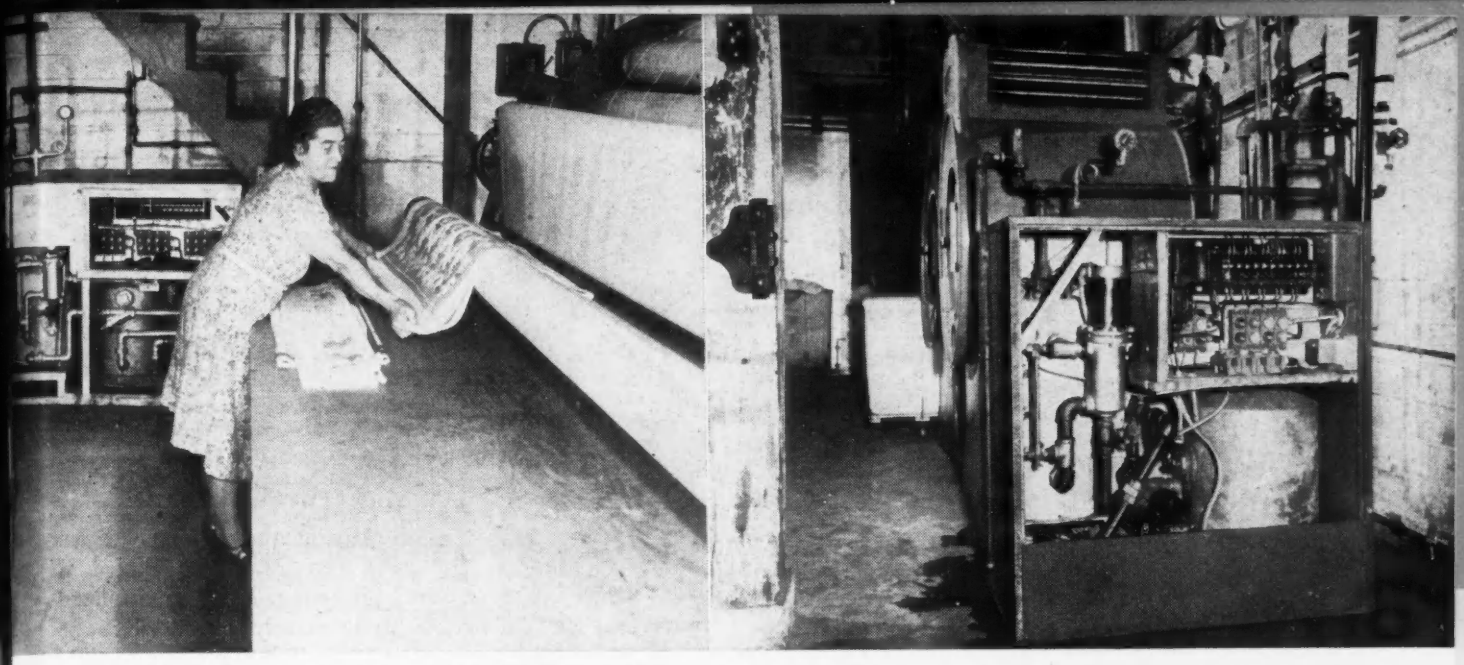
The unit on the 600-gal. water tank is of 24-kw. capacity. Mean temperature of incoming water is 47 deg., which is raised to 195 deg. To reduce the Btu.'s required to supply some 1,500 gal. of hot water daily, a heat exchanger is used, consisting of a 120-gal. tank. Through this the condensate from a five-roll, 120-in. American Flatwork ironer is circulated. This raises the temperature of 47-deg. city water to 84 deg.

The 600-gal. hot water tank must withstand the draw-off of 150 gal. of wash water the first thing in the morning, and possess sufficient recovery rate to carry the daily hot water usage. This the 24-kw. unit is doing very nicely, even with only the present 37-deg. pre-heat from the heat exchanger.

Steam Usages

For two 30 x 36-in. Heubsch tumbler dryers, handling 35 lb. of wet clothes each, another 24-kw. electric steam generator is used. Steam for the 120-in., five-roll flatwork ironer (mangle) is supplied by a 54-kw. unit. The same unit also supplies a 72-in., single-roll handkerchief ironer. Next is a 45-kw. generator supplying ten garment presses, the starch cooker and the soap tank. Another 45-kw. unit supplies twelve presses as well as steam heat for the office.

One of the unknowns in electrifying these presses was their steam requirements. Search of laundry journals and equipment manufacturers' data failed to yield certain very essential information. The electric boiler



FLATWORK IRONER AND TUMBLER DRYERS. Steam for 120-in., 5-roll flatwork ironer (left) is supplied by 54-kw. generator beneath stairway; 24-kw. unit on tumbler dryers (right) increased capacity of machines one-third

"First" All-Electric Laundry

manufacturer had to measure the condensate from several presses and from this estimate steam consumption. He was ultra-conservative in determining the electric-steam generation capacity that would be required and it turned out, by continuing to add presses to a temporary boiler, that double his estimate, or ten to twelve presses, could be fed from a 45-kw. unit.

Steam Generator Design

The electric steam generators are known as Vap-O-Lec, made by the Cronholm Manufacturing Co., of Portland, Ore. A vertical copper tank of 8 to 12 in. in diameter has a number of $\frac{3}{8}$-in. vertical copper tubes welded into head at each end. Centered in these tubes and brazed into the boiler heads are 18-in. long Calrod or Chromalox sheathed heating elements, with terminals on each end. Small holes at the lower end of the enclosing bronze tubes admit cold water. Because of the small clearance between the surface of the heating rod elements and the inside of the tubes, the water is quickly heated and is emitted from larger holes at the top as steam.

A feature of control is the use of a Minneapolis-Honeywell Modulator control. This consists of a bank of mercuroid switches actuated by motor-cam drive from a steam pressure gage. Thus, the heating elements are cut in and out in increments of 1,500 watts, or multiples thereof.

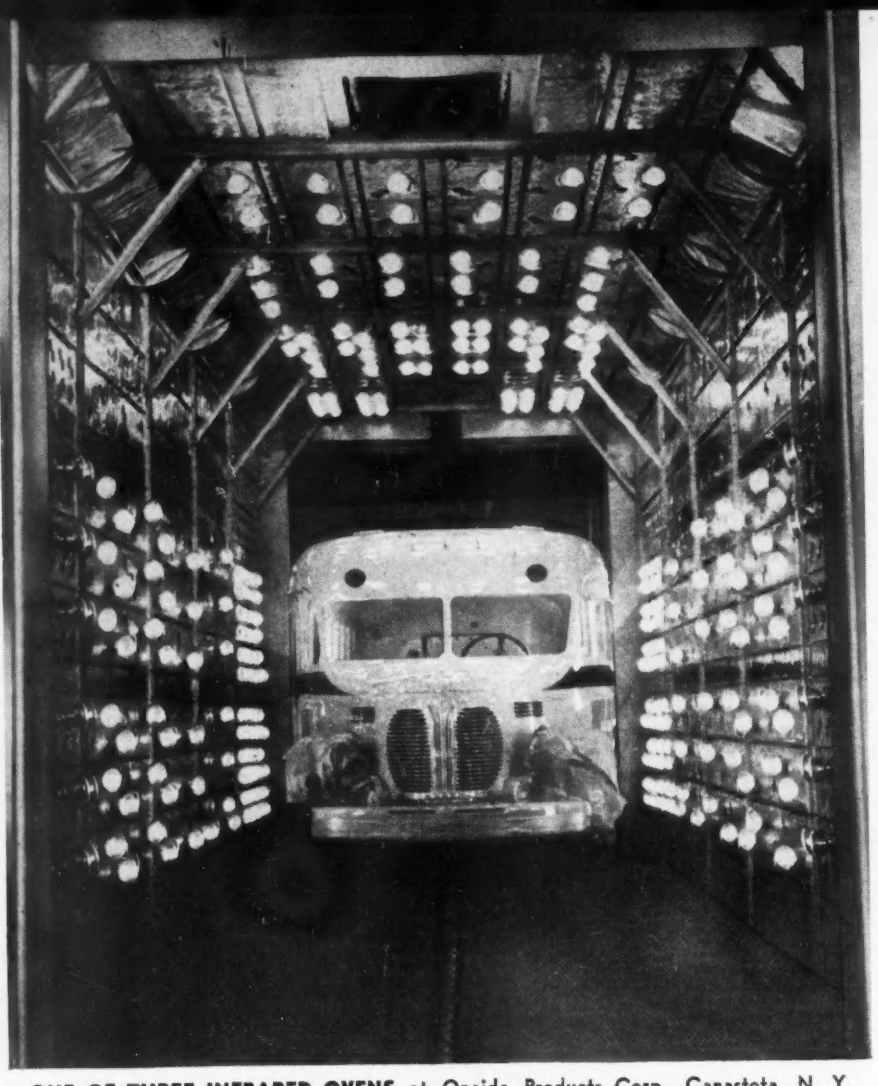
Proof of the pudding is always in the eating. Brown's bill for February, 1947, the first month of all-electric operation with permanently installed boilers, was $278.40, for 37,600 kw.-hr. This is an average rate of 7.4 mills per kw.-hr. Northwestern's heating rate for this class of service is: First 200 kw.-hr., 2¢ per kw.-hr.; next 800, 1.5¢; next 3,000, 1.0¢; next 6,000, 0.8¢; next 10,000, 0.7¢; next 30,000, 0.65¢; excess at 0.6¢. Minimum charge is $1.00 per kw. of demand. Measured maximum demand on the connected heating load of 192 kw. was found to be 200 kw. Demand in excess of boiler rating was due to the 240 volts supplied by the utility to the 230-volt rated units.

The New Broadway Laundry does a weekly volume of business of $1,500, which in trade parlance tells the size of the laundry. The owner's records show that he used $225 worth of fuel oil a month to fire the old boiler. His figures show that insurance, maintenance, and one-third of a man's time for operating the boiler, amounted to $138 per month. This, with $225 for fuel, made the total cost $363 per month, or a saving of $84.60 a month for electric operation.

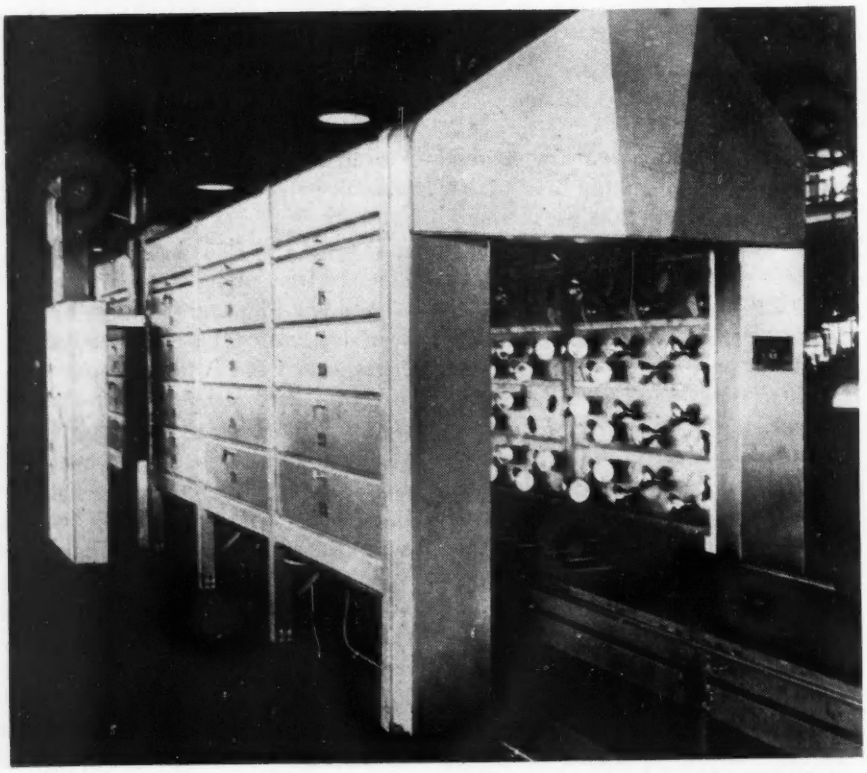
This shows a substantial pecuniary saving, but this is only part of the story. Electric operation speeded up work on the presses sufficiently to release two girls, or a production increase of 15-20 percent. The two girls, instead of being laid off, were retained in order to take on a greater volume of work. Drying time in the tumbler dryers was reduced 35 percent, or conversely, their capacity was increased about a third. Increased production from the presses resulted from having constant steam pressure of 100 lb. on equipment at all times as against fluctuating pressure with drops to 80 lb., with the old boiler. Formerly it was necessary for someone to fire up the old boiler at 6:30 a.m. to be ready to start at 8 o'clock. Now, the switches are thrown at 7:15 a. m. and at 8 o'clock full production can be gotten under way.

Another important benefit was release of the old 15 x 30-ft., 450-sq. ft., boiler room for productive purposes. Instead of tearing out the walls, Brown is converting the space to a dry cleaning plant. Being fire-proof, it was ideal for this purpose and makes possible an expansion of business he could not otherwise have undertaken.

The laundry is supplied with 240-volt, three-phase service through an 800-amp. main stwitchboard, by three 50-kva. transformers. M. S. Glenn, light and power consultant for Northwestern Electric Co., gave material assistance in bringing about this interesting all-electric laundry installation.



ONE OF THREE INFRARED OVENS at Oneida Products Corp., Canastota, N. Y., for baking finish on buses and highway trailers. Ovens have demand ranging from 150 to 200 kw. Arranged in tandem in conjunction with spray booths for prime and two enamel coats, ovens handle 30 buses or trailers a day. Prime coat is baked at 325 deg. for 15 min.; enamel coats at 265 deg. for 25 min.



INFRARED OVEN with pallet conveyor installation for handling heavy products

Baking and

PAUL H. GOODELL
Industrial Heating Engineer
Trumbull Electric Manufacturing Co.
Norwood, Ohio

REALIZATION of full benefits of infrared heating industrial processes can only be obtained if ovens are designed and constructed to utilize the principles set forth in the preceding instalment (June 21, p. 58).

Because of its primary virtue of high-speed heat transfer, infrared radiation is customarily used for the principal mass heating requirements. Through zoned construction the by-product convection is then employed to prevent excessive heat loss from the product during that portion of the cycle in which full temperature must be maintained. The convection may further be useful in a preheating stage for some applications as in paint finishing where high concentrations of radiation might cause violent evaporation of low boiling point solvents with objectionable results.

Oven Dimensions

Cross-section size of an oven must necessarily be such as to accommodate the products and lamp equipment in proper relative location for suitable heat exposure. The length of the heating zone depends on the time required to bring the product up to temperature and the speed with which it is to be handled if in a continuous process.

Fig. 5 shows a chart for computing oven length for the heating of steel products using an energy concentration of 7 watts per square inch.

Heat capacity for temperature elevation may be computed from the heat absorption chart in Fig. 6 if proper working efficiencies for the particular application are known. Fifty percent may be used as a representative value for good insulated equipment applied to dark products handled with good space utilization.

Since many lamp ovens are of the continuous type, steps should be taken to avoid excessive heat losses at the work entrance and exit openings. Air

Drying with Infrared Heat . . . II

locks, traps, or air curtains (the latter discharging a high velocity curtain of air across the openings), should be used to conserve the convection heat and at the same time prevent escape of fumes which may be of a toxic nature if derived from urea-formaldehyde finishes or other synthetic products. The escape of radiant energy through work entrance and exit openings may be prevented, first, by effective loading of the oven to assure maximum conversion of radiation to sensible heat; second, by directing lamps away from the entrance and exit openings; third, by use of supplemental baffles or if desirable by the addition of light locks, frequently built around a 180-deg. turn in the conveyor system at each end of the oven.

Life of Vital Parts

To assure satisfactory life of vital parts, it is desirable to locate all or most of the electrical system outside of the insulated wall. In view of the convection heat derived from the lamp envelope, the lamps should either be located in the recirculation air stream or within the principal inclosure, thus necessitating lamp holders of suitable construction to provide satisfactory service life at the intended operating temperature. The insulation should be of a type to provide a satisfactory thermal barrier for both radiation and convection. Polished aluminum and gold plated surfaces are in predominant use in combination with rock-wool, fiber-glass, asbestos and other types of insulation.

Classification of Service Requirements

Consideration of the service requirements in any particular case will seldom, if ever, necessitate that equal importance be attached to all the factors which have been discussed. This can be seen from the following list of items which should be considered, the conclusion being that each application warrants separate consideration as to the design of the infrared heating equipment:

1. Desired service temperature (infrared 600 F. or below).

2. Is process adaptable to surface heating?

3. What type of fuels are available in sufficient quantity to meet the heating demand in Kw. or Btu. per hour?

4. What factors involved necessitate quality considerations?

A. Thermal conductivity of product—low or high.

B. Is monoplane or three-dimensional heating involved?

C. Are organic-pigments or other limitations present?

D. Does the end result involve durability, uniformity, appearance or other exacting specifications?

E. What type of material handling will provide most effective space and heat utilization?

F. What ventilation requirements are involved?

G. Value and desired life of completed product?

5. How soon must products be handled after leaving oven?

6. Is sufficient space available to accomplish the desired heating result with the method of heating proposed?

7. Safety requirements for the materials being processed together with any limitations that may be imposed by surrounding conditions.

For illustration, critical internal temperatures and maximum uniformity are almost certain to be involved in drying the finish on wood furniture, due to limitations of glue joints and the low thermal conductivity of the material. Although a different cycle would be used, similar factors might hold true in baking the enamel on refrigerator cabinets due to the

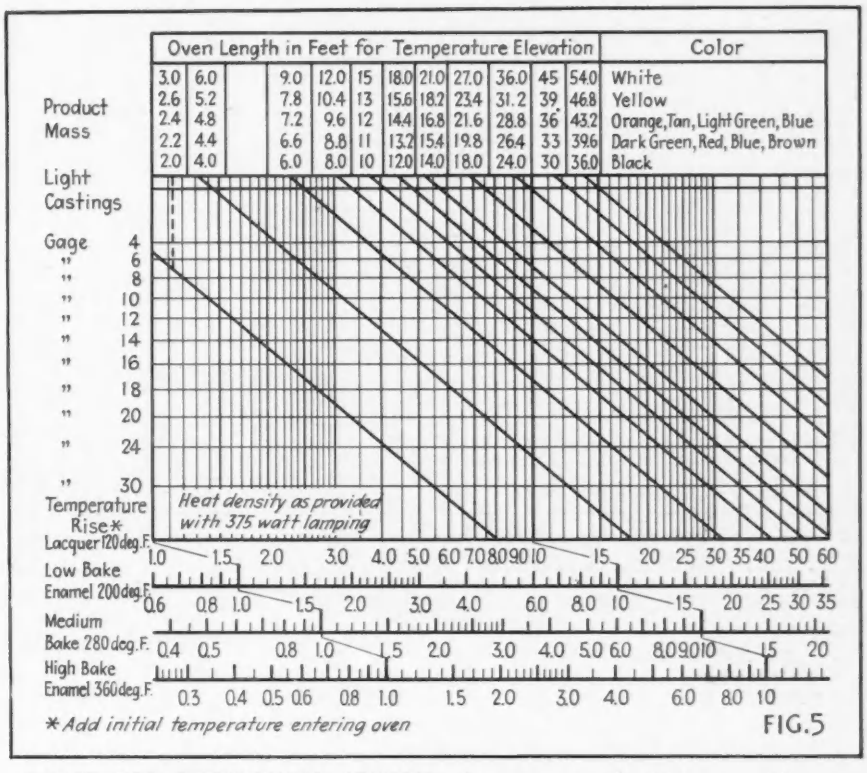

Oven Length in Feet for Temperature Elevation
Color
Product Mass
Light Castings
Gage 4 " 6 " 8 " 10 " 12 " 14 " 16 " 18 " 20 " 24 " 30
Temperature Rise*
Heat density as provided with 375 watt lamping
Lacquer 120 deg. F.
Low Bake Enamel 200 deg. F.
Medium Bake 280 deg. F.
High Bake Enamel 360 deg. F.
* Add initial temperature entering oven
FIG. 5

CHART FOR DETERMINING LENGTH of temperature elevation zone with oven lamped for heat transfer at 7 watts per sq. in. for baking paint on steel products. To use the chart select the intended speed of handling on the scale providing the desired temperature rise. Follow vertically from this point to the intersection of the horizontal line adjacent to the product mass. From this point follow the nearest diagonal line to the table where the length of the required heating zone will be found opposite the color of the product

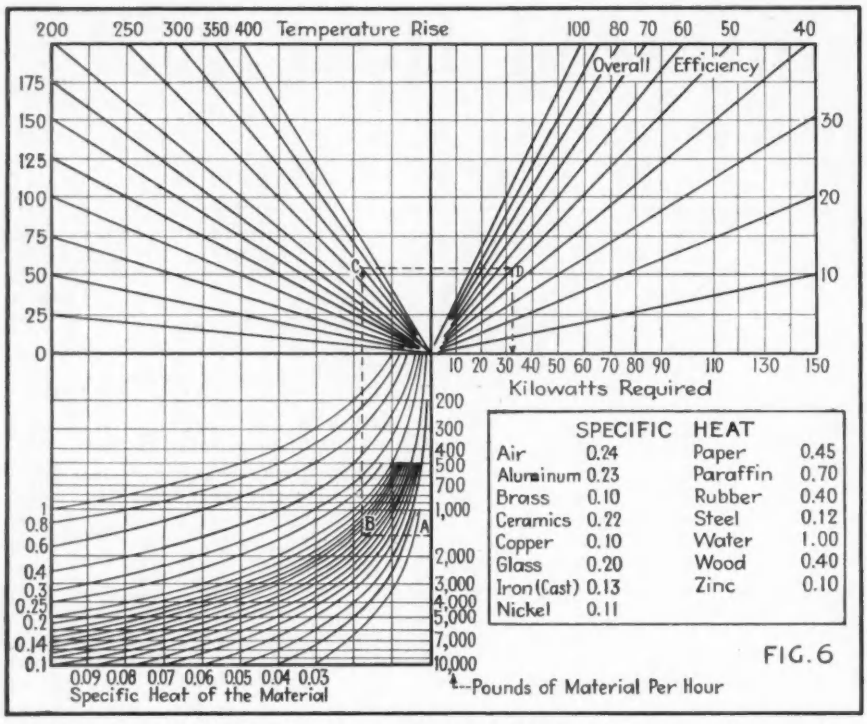


FIG. 6

CHART FOR DETERMINING OVEN HEATING LOAD for elevation of temperature

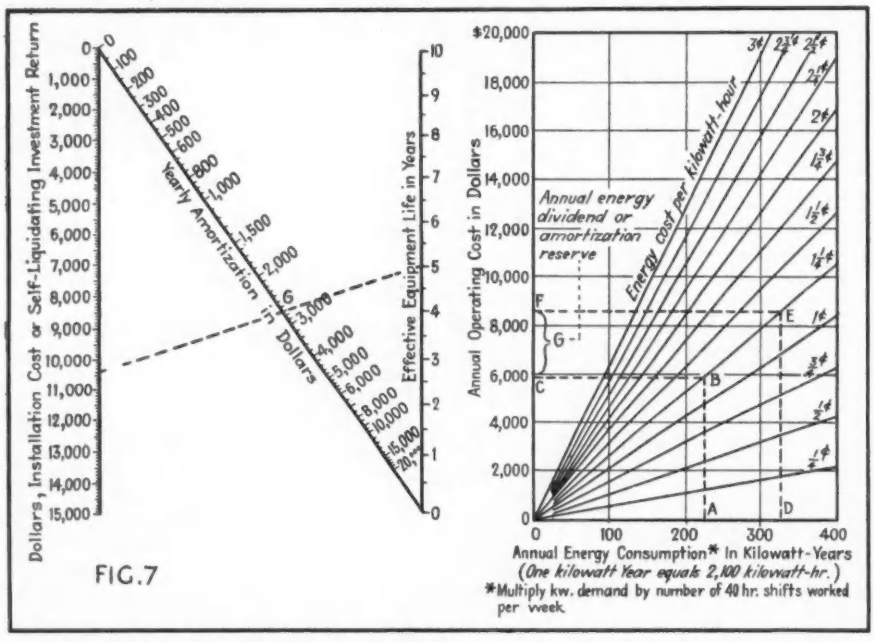

Dollars, Installation Cost or Self-Liquidating Investment Return
Yearly Amortization in Dollars
Effective Equipment Life in Years
Annual Operating Cost in Dollars
Annual energy dividend or amortization reserve
Energy cost per kilowatt-hour
Annual Energy Consumption* In Kilowatt-Years
(One kilowatt Year equals 2,100 kilowatt-hr.)
*Multiply kw. demand by number of 40 hr. shifts worked per week.

FIG. 7

COST CHART FOR ELECTRIC HEATING. Example: For typical cost comparisons of insulated and uninsulated electric ovens obtain kilowatt demand for each type and follow the sample computation

A = Energy consumption for insulated oven (225 kw. years)
D = Energy consumption for uninsulated oven (325 kw. years)
B & E = Indicated kilowatt-hour rate with prorated demand charge (1¼c).
C = Annual operating cost for insulated oven ($5,950)
F = Annual operating cost for uninsulated oven ($8,650)
F — C = G = Annual energy dividend or reserve for amortizing added cost of superior insulated oven ($2,700)

Transfer G value ($2,700) to diagonal scale on N chart. Draw line through G and expected useful life of oven, H (five years). Extend line to I and read ($10,400), the self-liquidating investment return resulting from the saving in energy cost.

This indicates that the maximum investment which can be justified for the uninsulated oven will be $10,400 less than the cost of the insulated oven. Insulation and other energy conserving features of quality electrical equipment often pay for themselves in much less than normal service life with added dividends contributing to further plant improvements, operating surplus or profit

color and durability of the finish desired. Metal toys on the other hand, because of small size, relative value and short anticipated life would probably be processed satisfactorily with few, if any, quality considerations, although quantity of production and operating economy might influence the design of the heating installation.

Economic Issues

A convincing example of cost savings by judicious use of infrared energy through optimum adaptation of the equipment and its operation is afforded by a case in which the input was reduced from 165 kw. to 55 kw. —an even two-third reduction. This job was one of baking synthetic enamel finishes at the National Cash Register plant in Dayton. The physical changes in the oven were shown in the two comparative views which comprised Fig. 3 of the preceding installment.

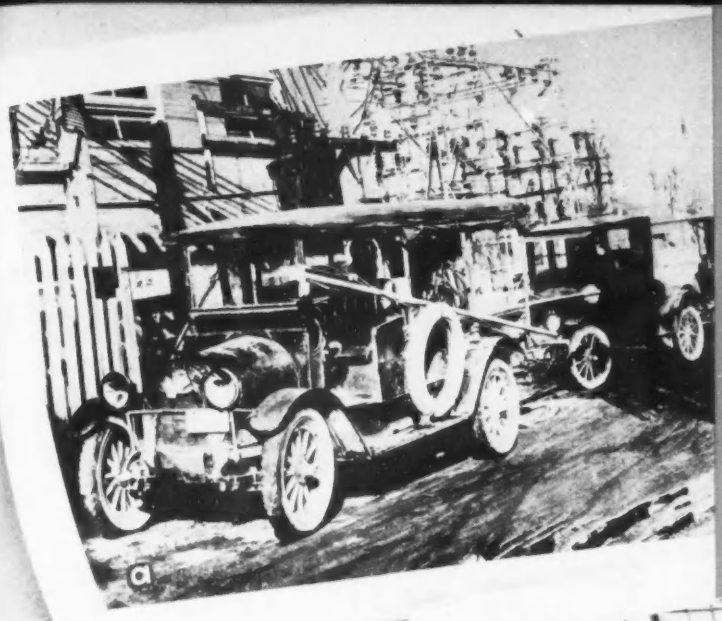
The basic changes responsible for this improved performance include:

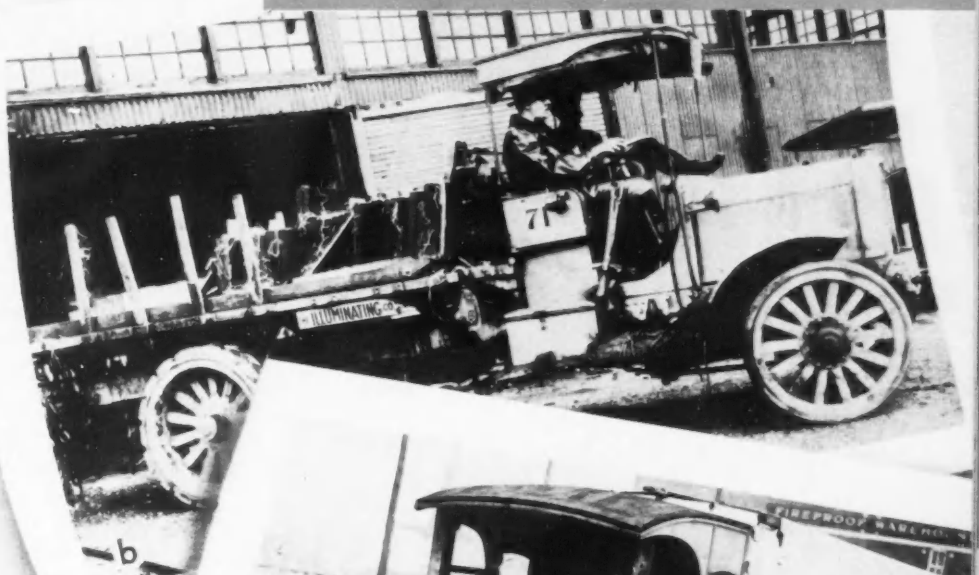
1. Insulated construction.
2. Heat traps at the entrance and exit openings.
3. Complete conservation of convected heat.
4. Suitable air recirculation.
5. Judicious zoning of infrared equipment.
6. Use of self-contained reflector lamps.

Radiation Plus Convection

Since operating costs usually outweigh investment considerations with infrared heating, the judicious use of infrared and convection is a foremost consideration with lamp heating. A chart for computing relative investment and operating costs is shown in Fig. 7. Annual operating cost may be obtained on the right hand chart by progressing vertically from the kilowatt demand to the average kilowatt-hour rate, then horizontally as shown. This computation assumes that full load is required for 2,100 hours per year (40 hours per week). On the left, yearly amortization can be determined for any desired life, permitting relative comparison with operating cost, or the purchase value of any improved performance feature can be appraised as shown by the sample calculation.

UTILITY TRUCKS ARE TRAVELING WORKSHOPS





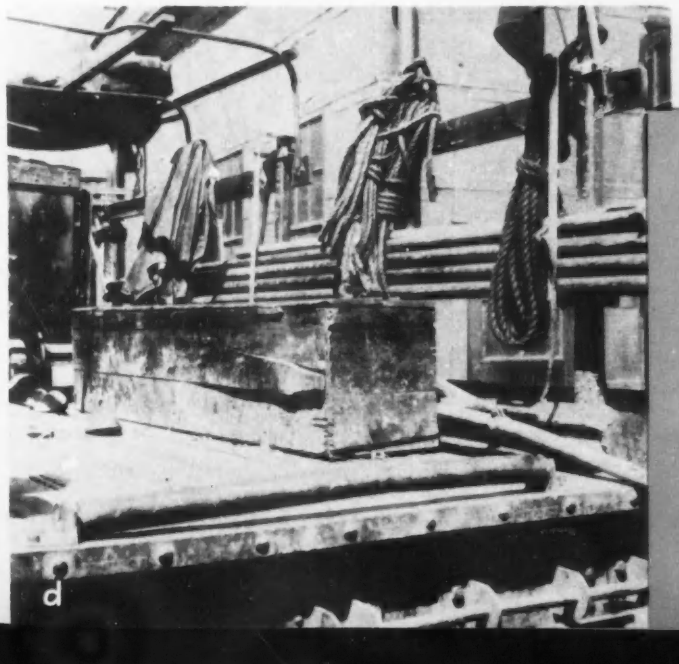
YESTERDAY'S WORKSHOPS

TRANSPORTATION equipment. A district fleet (a) in the choke-coil and arc lamp days of 1922

HEAVY HAULING, with plenty of fresh air for the crew, (b) on this Peerless truck

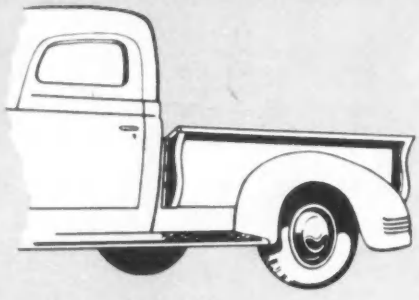
PROTECTION for the crew and the load of tools and materials (c) was provided a few years later by the tarpaulin stretched over a wood frame

A PLACE for everything, (d) on the floor and in the "tool-box"

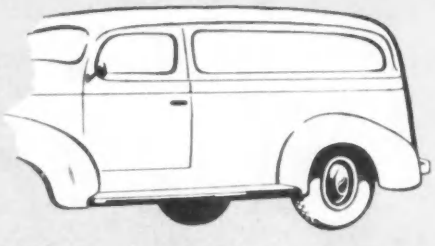


A truck that can take a crew of men and all their tools and materials to the job location for a day's work—and then back up to the job and go to work with the men — that is a traveling workshop

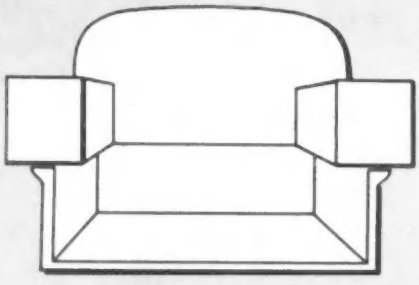
FRANK SANFORD
Western Editor



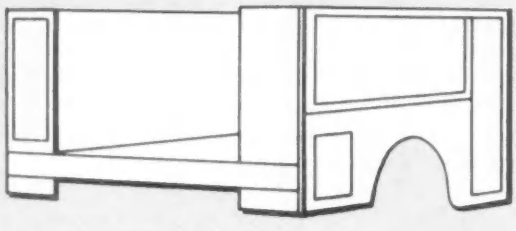
Light service for pick-up and delivery



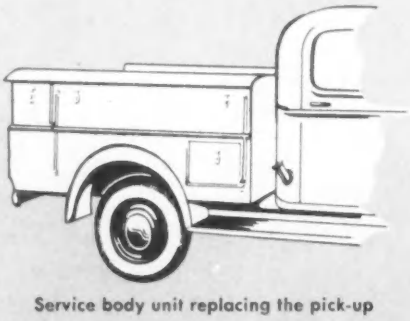
Panel bodies are adaptable for light-duty repair and service



First step is tool space on the pick-up body



Next step is this body using all the space along sides



Service body unit replacing the pick-up

Utility Trucks Are

TRANSPORTATION is the primary function of a utility truck – to furnish a conveyance for men, material and tools from headquarters to locations on the far-flung systems for distribution. The systematic manner of providing this service, as embodied in modern truck body designs, is a product of about twenty years development. In the early decades of electrical construction, wagons and then general purpose trucks furnished transportation – but little more.

Traveling workshops are distinguished by the combination of this primary purpose of transportation with the functional design of bodies to make possible a space for everything used on a particular type of work, and the addition of labor-saving tools and accessories. They are definite time and labor savers. Automobiles or buses could take the men to the job faster, and open trucks or moving vans could haul more material. These arrangements are used by some companies for special construction projects, but the "workshop on wheels" in one of its several designs is the backbone of electric utility transportation.

Costs for functional design bodies and accessories are high because of many special requirements. Designs are to fit the district and crew organization of individual companies. Quantities of any design manufactured are low, and production line assembly is in general not possible. Many utility companies have truck body layouts of their own and each order for manufacture has been the subject of review for possible improvements. This widespread attention has contributed much to the functional design when added to the development work of body manufacturers.

Some degree of standardization has followed in the models offered by the individual manufacturers, and the purchasing trend now is to select one of these designs that best suits the requirements of the job. Many accessories are available in models to fit various body arrangements, and the principal purchase choice is the selection and assembly of these units to fit construction or maintenance arrangements of the utility organization.

First consideration must be given to the size chassis and general style of body required. Details of compartments and racks, with space for tools, supplies, rubber goods, ladders and other regular items to be carried are essential in planning the body layout. Winches, derricks, diggers and powered platforms or lifts may be desired. Special tools, as air compressors, pumps, paint spray equipment or transformer rigs should be planned for, so that they take minimum space on the truck. Provision

Traveling Workshops

should be made for radio equipment, maps and drawings, and numerous safety and convenience features must be included throughout the design.

Body Design

Utilization of every cubic inch of space is the keynote of body design for the traveling workshop. Few building designs can compete with utility truck bodies for efficiency in the use of space available — even to the model kitchen layouts. The objective is to provide compartments, shelves, cupboards and racks and still leave platform space very nearly equal to the open truck for heavy materials, reels and equipment.

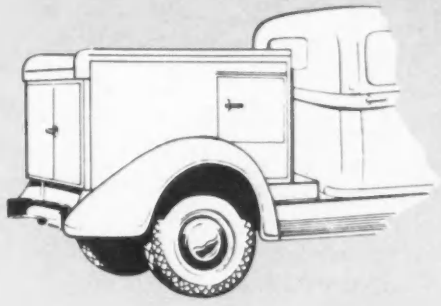
Within an allotted set of dimensions of length, width and height, the all-steel body designs provide these facilities in units which are ready to bolt on the truck chassis. Modern methods of fabrication with welding and good engineering design permit use of the partitions and compartments themselves for furnishing the necessary strength and rigidity. Every cubic inch of space is used — over the wheels and down the sides, under the floor and over the top.

Principal body styles are classified by the purpose as light pick-up, service, maintenance, heavy construction, general purpose and for various special uses as tree-trimming, street light repair, and meter installation. Associated with each of these body uses are also the various arrangements for mounting of ladders, derricks, hole diggers and other equipment.

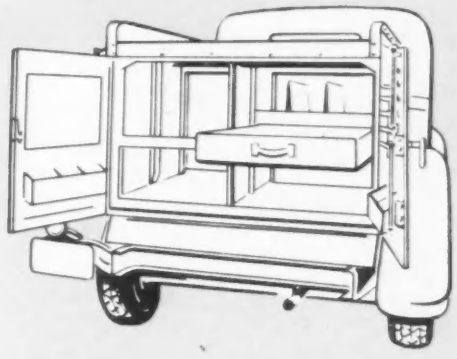
Light Service

Many utility organizations prefer the light weight pick-up or panel truck for one-man and two-man service and trouble crews. Portable tool boxes and racks may be provided and ladder racks are often mounted over the top. These body styles are available from the automobile and truck manufacturers' assembly lines. Panel trucks nominally rated from ½-ton to 1½-ton have been especially favored for meter and service crews because of the large totally-enclosed storage space available for supplies. Special mountings for voltmeters, appliance repair supplies and for many other purposes show the ingenuity of the men who have used these trucks.

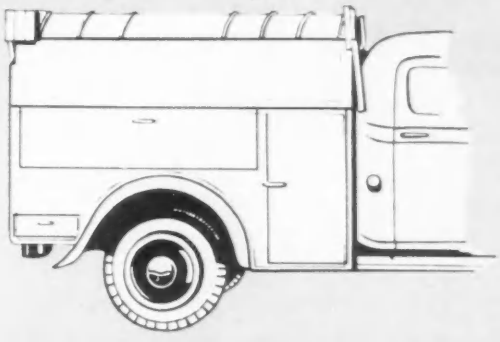
Lightest weight of the specialized body styles is the "all-purpose" or service body unit replacing the open rear end of the pick-up. Designed particularly for ½-ton to 1-ton chassis mounting, several optional arrangements



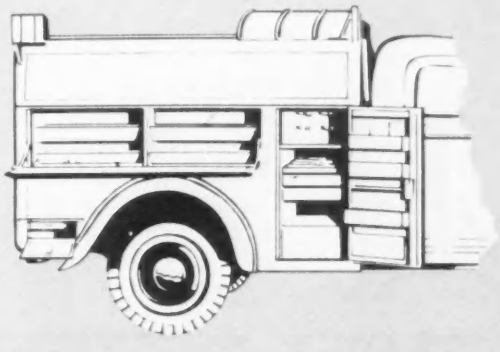
— May be inclosed for further specialized storage



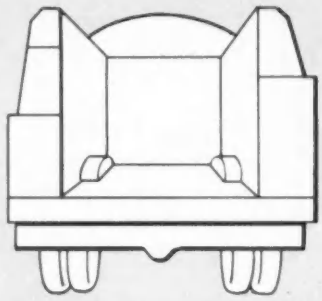
— Which opens to well arranged trays and racks



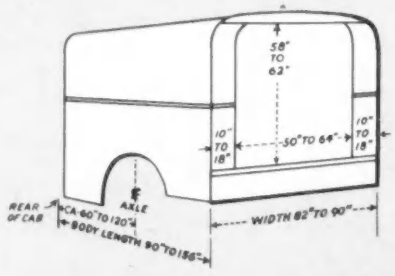
Medium-duty truck body raises sides for more storage



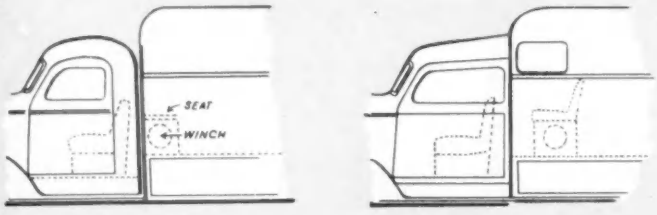
— With compartment space and telescopic top open



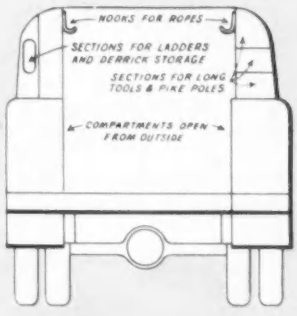
Compartments and racks along sides do not greatly reduce the floor space of the truck



Trucks and bodies are fitted together by designation of CA and overall length dimensions. Other measurements vary within narrow limits



Extra seating comfort for the crew may be provided with little extra space requirement. Left, seat over winch, facing rear of truck; right, turned forward and full width of truck


HOOKS FOR ROPES
SECTIONS FOR LADDERS AND DERRICK STORAGE
SECTIONS FOR LONG TOOLS & PIKE POLES
COMPARTMENTS OPEN FROM OUTSIDE

Three factors in body design: Free of projections beyond body side lines; Side compartments up to height easily reached from ground; Space for ladders and long tool storage in upper section

are available in standard models, including compartment layouts for general repair, cable splicing, service and metering, trouble and similar light duty operations. Some designs feature flexibility by providing compartments with movable partitions. In the larger models many of the features that may be added in a panel truck are incorporated in a general service body completely equipped with compartments ready for chassis mounting.

Medium and Heavy Duty

Weights and space requirements for construction tools and all of the materials for a day's work add up to the carrying capacity of trucks nominally rated at three or four tons. Ease of handling on city streets and comfort for long runs plus power to pull off the highway for many construction locations are additional factors. Conventional four-wheel trucks with moderate wheelbase lengths have usually met these requirements, and relatively few tractor-trailer types have been used.

Sizes of the several body styles vary principally in length, the most popular dimensions being in the range of eight to ten feet and with a maximum of 13-ft. Overall body widths are relatively fixed, from 7½-ft. to 8-ft. Dimensions from floor to roof are about 5-ft., and all body designs include a removable top to permit working erect on the truck floor. This working space is about 4-ft. to 5-ft.-4-in. wide, with compartments along each side using up to 18-in. of the overall width.

Two basic measurements for all body designs relate these units to the truck chassis to be used. The overall body length is usually the same or very close to the truck frame length. The second dimension is the distance from back of the driver's cab to the center line of the rear axle, where provision must be made for the body floor to fit over the rear wheels. Relations between these two measurements and their difference, or body overhang, determine the load distribution and driving balance of the truck.

Seats

Seats for the crew have not always been considered a part of the body design but most models now do provide a seat which is combined with the winch enclosure, back of the driver's cab and facing the rear of the truck. On some larger models this seat is reversed, so that the men can ride facing the direction of travel, and an entrance is provided adjacent to the driver's cab. By raising this seat above the level of the tool compartments along the sides, a space wide enough for four men is obtained with very little sacrifice in tool and material space. Riding comfort for the entire crew, with both ventilation and heating, may pay dividends in extra time gained on the actual work.

A Place for Everything

All the materials and tools regularly carried on a utility truck could be stacked on the truck floor, with a few boxes for smaller items. The floor area would be covered to a depth of one or two feet. Then the cross-arms, wire reels and other heavy items for the day's

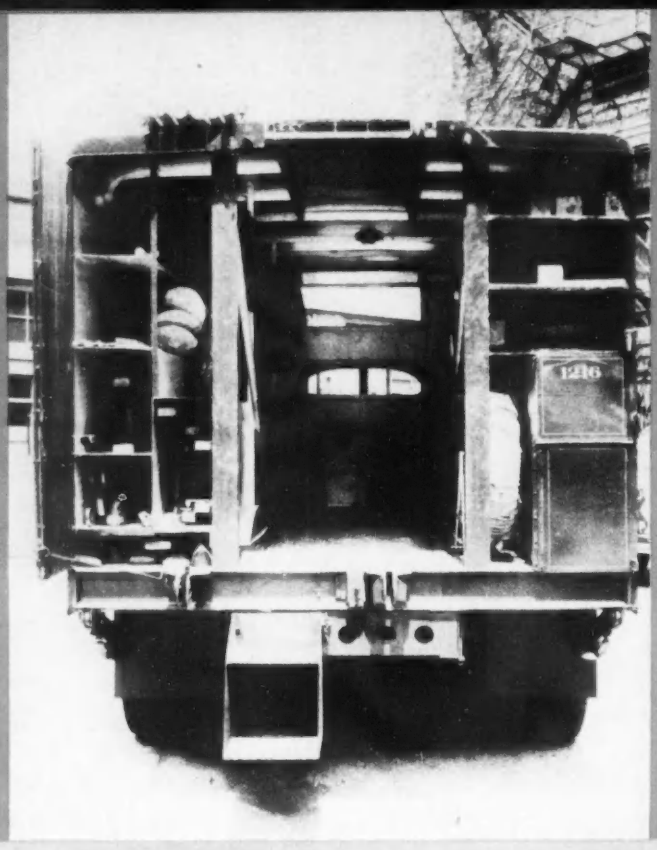
PLENTY OF DRAWER SPACE is the first step toward orderly storage for dozens of miscellaneous items

TWO-MAN TROUBLE RIG on a 1½ ton chassis, used for service, emergency maintenance and similar jobs

UNUSUALLY LARGE STORAGE SPACE for a 1½ ton truck is provided in this two man trouble rig. Rear view shows space under the floor for a short extension ladder

TRAFFIC WARNINGS by conspicuous rear end markings

A PLACE FOR EVERYTHING can properly describe this modern truck workshop. Note capstan winch in front compartment



SHELF SPACE is increased for crossarms and long tools (left) by reducing the floor space to aisle width. An angle frame extends in from the usual compartment dimensions . . . Riding Comfort for the crew (right) is a feature of this body plan

work could be piled on top. Stake body sides and a tarpaulin for protection would complete the picture—which is familiar to every lineman of twenty years ago.

More cubic feet of storage space is provided in the vertical arrangement of compartments in a modern utility body than would be available in a depth of two feet over the whole floor of the same truck. This design uses about one-third of the floor area, leaving the central section for heavy materials and work space. Orderly storage, protection of cutting edges, and ease of finding and returning tools are part of the modern picture.

Sliding type trays, tote trays, rods for climber hooks, saw racks, weatherproof storage for rubber goods and special racks for ladders, ropes, pole jack and tamps—all are parts of this modern design. Free of outside projections, the body is a public appearance asset as well. It is a mark of construction and maintenance efficiency in which each inch has purpose and each tool has place.

The major part of the storage space is between double walls built the length of the truck along each side, in the vertical plane of the wheels. In the larger models compartments and racks extend from the ground clearance line to the maximum height of the truck except in the wheel section. A majority of the plans provide from two to six doors on each side of the truck for access to trays and racks of each section. Doors are generally of the drop type, horizontally hinged at the bottom, so that each door serves as a convenient shelf when open. Doors outside extend up only to a height easily reached from the ground. Shelves and racks inside the truck body then start about two feet above the floor, and do not interfere with storage space on the floor.

Compartments for small tools and materials most often used are generally on the right side of the truck, opening toward the curb. A drinking water cask and cup dispenser and space for the foreman's construction handbooks, maps and prints are useful extras.

Trucks

Payload as measured by the majority of truck operators would be considered a small part of the gross vehicle weight in the case of utility trucks. The workshop load as represented by the body and more-or-less fixed tools uses a large part of the useful carrying capacity. Load distribution for a well balanced transport unit therefore becomes largely a matter of coordination in the selection of wheelbase, body length and principal heavy tools mounted on the truck.

Accurate mathematical methods are often essential for determining the relation of gross load on front and rear axles. Shifting the center of load a few inches forward or backward on the chassis can mean a great difference in steering, tire wear, traction and maintenance. The basic formula and calculations determine the center of load in relation to the supports, just as applied to beams. A technical approach is essential in mounting accessories and in providing for trailers.

For conventional utility truck and body assemblies, a relatively small number of the hundreds of possible adaptations and combinations are used. The accompanying tabulation is illustrative of the factors. Exact values will vary with different makes and sizes of trucks. In the conventional chassis, with engine under hood and cab behind, the general recommendation places approximately ten percent of the body and payload weight on the front

Examples of recommended load distribution for conventional chassis and body assembly.*

Body length, ft.	Cab to axle, in.	Body overhang in.	Weight center to rear axle, in.	Body and load distribution, % Front	Rear
8	60	39	9	6½	93½
9	72	39	15	10½	89½
10	72	51	9	6	94
11	84	51	15	9½	90½
12	84	63	9	5½	94½
12	96	51	21	12½	87½
13	96	63	15	9	91

*From International Harvester Co. Bulletin CT-209

axle, and acceptable balance is obtained within a range of six to 13 percent. Four principal dimensions must be coordinated with the wheelbase: (1) Body length (2) CA, rear of cab to center of rear axle (3) Body overhang (4) Center of body-and-load weight to rear axle.

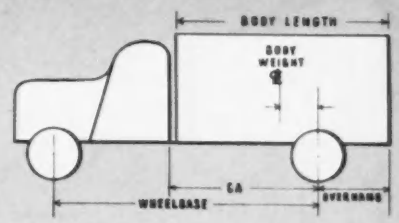
Many construction and maintenance departments have adopted other arrangements of the chassis for some or all of their trucks. Shorter wheelbase dimensions are possible with cab-over-engine types, giving easier maneuverability in congested areas and longer bodies for a restricted overall length. Some disadvantages in riding quality, accessibility for engine maintenance and for getting in and out of the cab have, however, kept these types from becoming popular for general use.

Selection of Truck

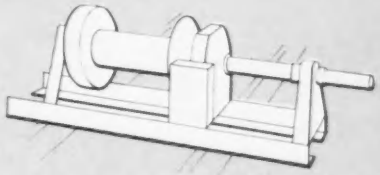
A distinctive feature of the truck industry, in contrast with passenger automobile production, is the arrangement to supply many variations from standard. Wheelbase, tire size, four or six wheels, and body length are obvious variables. Engine size can be selected, several gear choices are available, braking and frame details can vary. Hundreds of combinations and adaptations of principal models are available to fit individual jobs precisely.

All trucks are classified on the basis of gross vehicle weight ratings. Tonnage ratings were formerly used, and are still used to some extent for general reference, but they are relative only and do not give an accurate measure of either capacity or size. The generally accepted classification is "light" for g.v.w. up to 9,000 lb., a nominal tonnage rating up to 1½-tons; "medium" for g.v.w. to 16,000 lb., which includes some models of 1½-tons and some of 2-tons nominal ratings; "light-heavy" for g.v.w. up to 24,000-lb. and "heavy-heavy" for higher ratings. Larger utility trucks with nominal tonnage ratings of two, three or four tons are therefore in the "light-heavy" class.

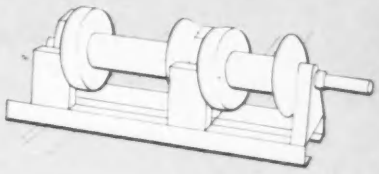
The basic dimension in relating body and chassis design has been standardized by the Society of Automotive Engineers. Cab to axle (CA) measurements in the medium and light-heavy class trucks are generally one of the following (in inches): 60, 72, 84, 96, 108, 120. Overall



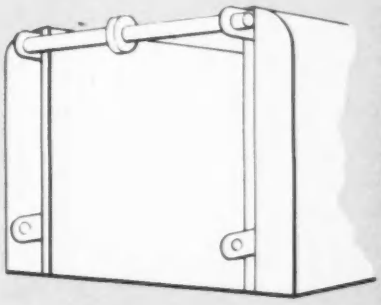
LOAD DISTRIBUTION on the truck is determined from these principal dimensions. Additions of heavy equipment may move the "payload" weight center



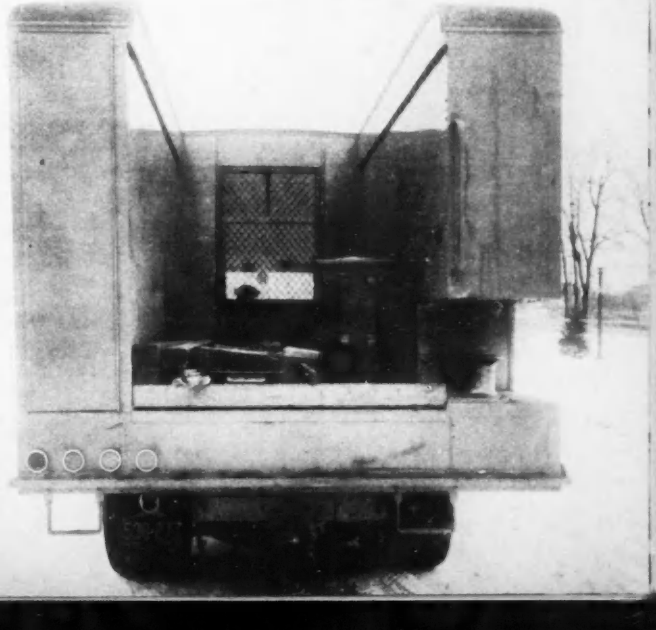
SINGLE-DRUM WINCH has shaft extending to right side of body for mounting winch head or wire reel



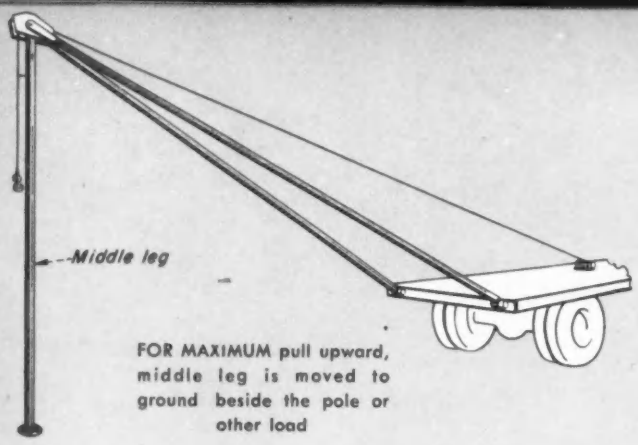
DOUBLE-DRUM WINCH with drums independently controlled



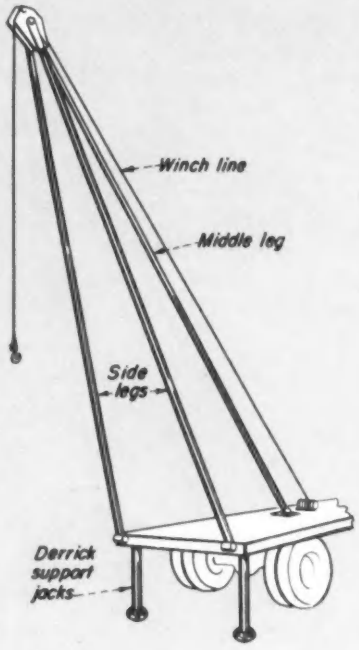
SPINDLE AND SHEAVE installed across rear of body may be used in either upper or lower position to guide winch line clear of truck



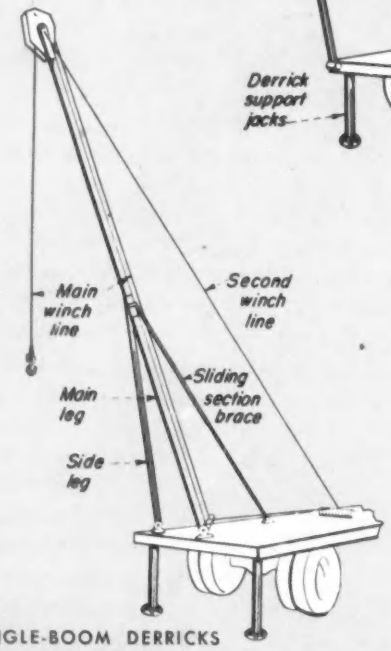
CAPSTAN WINCH, used with a snatch block, permits full loading of the truck floor. An alternative location in a side compartment, shown in a later illustration, requires less complicated drive than rear mounting



FOR MAXIMUM pull upward, middle leg is moved to ground beside the pole or other load

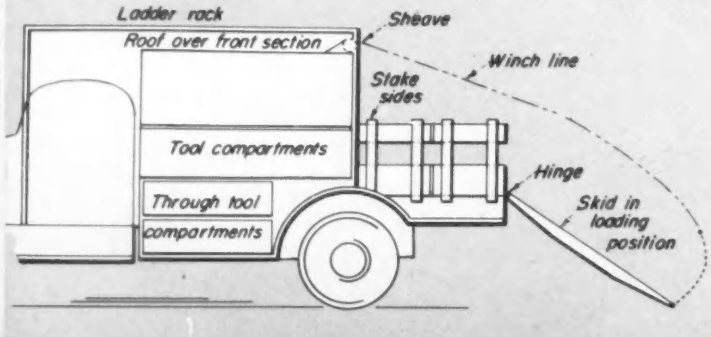


MIDDLE-LEG DERRICK rigidly mounted on the truck with support jacks to prevent sagging of springs under derrick loads



SINGLE-BOOM DERRICKS are flexible in position and may be moved to any desired angle by second winch line

TREE TRIMMERS' TRUCK with winch line to pull skid into upright position as rear end of body after brush is loaded



truck frame and body lengths corresponding to these CA dimensions may be varied somewhat with different body designs. Wide variations are possible in wheelbase dimensions, nominal load ratings and engine and cab mounting arrangements of the many truck models. Holding to one of the standard CA dimensions is therefore the best common denominator in general combination of body and truck designs.

Engine and transmission systems are relatively fixed for each of the standard truck models. A wider selection of gear ratios is available for heavier models, and four or five forward speeds are provided in some transmissions to cover a range of requirements. For general purpose light duty trucks three speeds usually suffice, with four-speed transmission limited usually to heavier and off-the-road construction trucks. High road speeds are seldom required on these services, but ability to start with a heavy load under adverse conditions of transmission line right-of-way may necessitate a fourth gear.

It is very important that trucks for workshop service be provided with a power take-off for winch, cable reel and similar operations. Other problems, such as tire size, legal requirements, springs, brakes and many truck accessories are subjects for consideration in the light of experience and guidance from truck specialists. All of these factors should, however, relate directly to the body design and purpose. The truck is selected to carry the workshop and not the other way around.

Power Accessories

Line construction and maintenance — setting poles, stringing wire, pulling cable, mounting transformers and many other tasks — take a lot of pushing and pulling and lifting. While mechanization as practiced in the factory production line is not possible, labor-helping devices can go a long way in that direction. Winch lines and derricks can replace tackle lines for the heaviest jobs and they can make the lighter work easier and faster. They are the principal accessories for power application on the traveling workshops.

Winches

Provision for the power take-off is ordinarily part of the truck manufacture, and the winch and all of its accessories are part of the body layout. An opening in the truck transmission — the S.A.E. power take-off — is suitable for small winches, but a special gear housing installed in the truck drive shaft directly back of the transmission is essential for the heavier winches. All speeds, and reverse, are available for the winch, and the winch drive may also be operated simultaneously with the truck drive. Free turning of the drum to allow cable pay-out by hand and provision of a drum brake are essential for most operations.

The winch is nearly always mounted directly back of the cab, on the front end of the truck floor, with control at the driver's position in the cab. The control handle may be mounted on the winch, to be reached from the cab rear window, on lighter operations. Mounting brackets are advised for clamping the drive and winch to the truck frame to avoid drilling of the frame.

There is considerable latitude possible in the selection of winch models, with variations in drum diameter and length, and resulting cable length capacity, as well as in load capacity. Ratings of 5,000 to 15,000 pounds and drum diameters of six or eight inches are widely used, with other ratings up to 30,000 pounds or higher available for special applications. Winch cables vary from one-quarter to one-half inch steel rope and drum capacities, depending on rope size as well as drum length, may vary from two or three hundred feet up to one-half mile.

While single-drum winches are most commonly used and will serve for the principal power on all the usual operations, there are many confirmed advocates of the double-drum winch. This is necessary with the single boom type derrick and there are also other pulling and lifting jobs where an auxiliary cable is helpful. The second drum is a duplicate of the main drum except in length, and it is independently operated and controlled. For most operations with the stiff-leg derrick, a winch head, or niggerhead, will usually serve in place of the second drum for the auxiliary source of power when needed.

The winch shaft extension for detachable heads is a very practical and valuable addition to the winch. Wire reels for pay-out or take-up and rope capstan heads are available to mount on the shaft, which extends to the outside line of the body.

In another arrangement a capstan winch is used for all winch line purposes. It may be located on one side at the rear end of the truck, requiring a drive shaft but having the advantage of avoiding the winch cable pull over the truck floor. The capstan may also be mounted within the body line back of the cab, as in an accompanying illustration. Manila rope is used instead of steel cable, and a snatch block is necessary for any hoisting work.

A spindle and sheave is essential for use with the winch cable, to guide past the rear end of the truck. Mounting brackets at the top of the body permit pulling over a load on the truck floor and also furnish head pull for lifting reels and boxes up to the truck level. One design of sheave block is available for mounting in a socket at the rear end of the truck. It is arranged for pulling up or down or from either side, without the use of snatch blocks.

Derricks

Middle or stiff-leg type derricks are most commonly used on utility trucks. Side legs, varying in length from 15 to 25 ft., are attached by hinge brackets to the rear of the truck body and a middle leg which is 20 to 30 ft. long is attached to a bracket toward the front of the truck floor. This leg may also be set on the ground to give maximum strength for pulling poles.

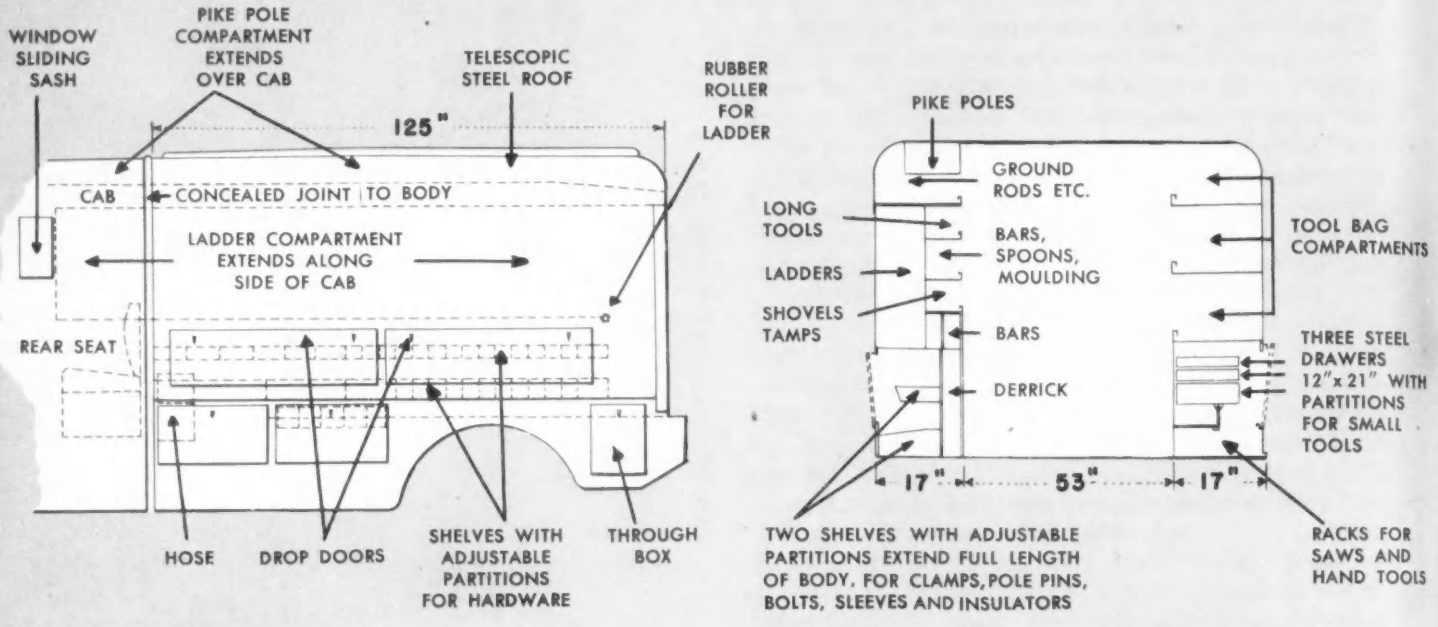
Single-boom type derricks have one side leg as a truss and a telescoping leg is hinged to the front of the truck floor. The boom is held upright by one of the winch lines, while the second winch line passes through the sheave for regular hoist use. The front leg has an internal compression spring to force the main boom away from the winch line pull. Because this type derrick is flexible in its position while in use, it is becoming increasingly popular for work under and between overhead lines. The

HYDRAULIC POLE PULLER. Double action loosens and pulls poles from hard packed earth, and the boom holds the pole erect for moving

POLE HOLE DIGGER brings dirt up and out fast. Unit is mounted on a light truck with compartments for tools and supplies

DRILLING at any angle is possible with side to side levelling positions of the machine. Holes may be dug 10-ft. deep and the derrick handles poles up to 45-ft. length

FRONT ON BEHIND to give the operator full view of his drilling



front leg may also be set on the ground for pulling poles.

Derrick legs are often longer than the body of the truck on which they are to be carried, so that they project alongside the cab or out to the rear of the truck. The body layout should be arranged to prevent interference with the cab door opening and long overhang beyond the body line may also be objectionable. Side legs which may be disassembled into shorter sections are available and the more compact storage may be a helpful feature in planning the body.

Most derrick construction is with members of steel tubing. A saving of 50 or 60 percent in weight and easier assembly and mounting are possible with aluminum alloy derrick members. Because of the light weight, one man can assemble and operate these derricks. Capacities available are rated the same as with steel.

Important accessories for the derrick are the rear end support jacks to relieve the springs and tires of excess weight during heavy lifting. They are adjustable to the ground level and are set to full length when the derrick is mounted. Hinge brackets for the jacks provide the most convenient arrangement for mounting. They may then be swung up to a carrier rack under the body when not in use.

ACKNOWLEDGEMENTS

For material used in preparing this special section, ELECTRICAL WORLD is indebted to American Coach & Body Co., A. B. Chance Co., Cincinnati Gas & Electric Co., Cleveland Electric Illuminating Co., Commonwealth Edison Co., Dayton Power & Light Co., Detroit Edison Co., Four Wheel Drive Auto Co., Gar Wood Industries, Highway Trailer Co., International Harvester Co., James R. Kearney Corp., McCabe-Powers Auto Body Co., Public Service Co. of Northern Illinois, York-Hoover Corporation.

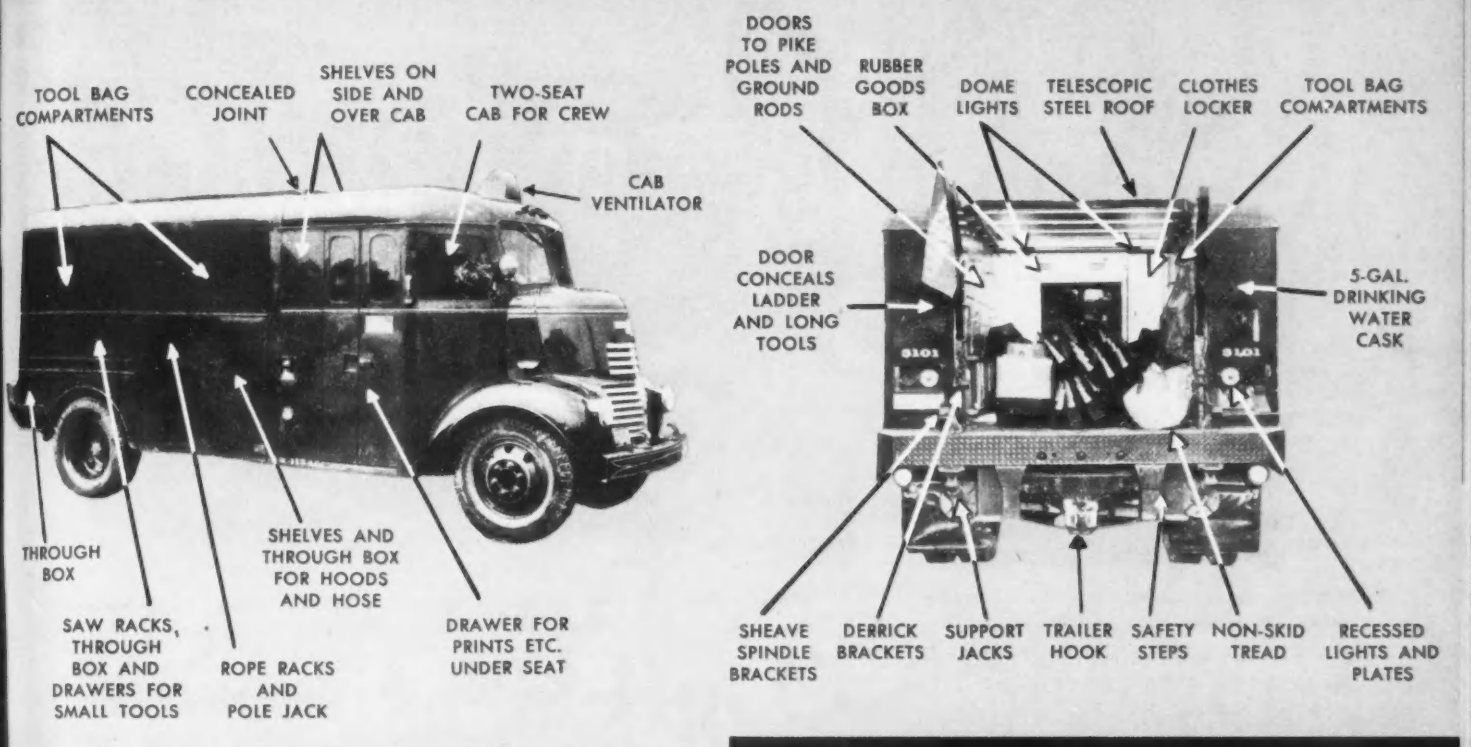
Pole Pullers

Derricks, with one leg set on the ground, may be used for removing poles, with the aid of pole jacks to loosen and start the pull. Where a considerable amount of this work is necessary, as in moving a line for road widening, a special rig may be justified. The pole puller shown in an accompanying illustration has double action, with a spud forcing against the ground to absorb the reaction of lifting. Power is furnished by a hydraulic unit, and poles can be pulled from hard packed earth or concrete without the use of jacks or other equipment. The truck is equipped with a light A-frame boom for holding the pole vertical and for handling it after it has been pulled.

Ladders

Lineman's spurs are still the best tools for climbing poles, but there are many jobs above ground—house service brackets, street lights, and on steel poles—where a ladder must be used. For the occasional climb, an extension ladder is carried on most of the regular construction and maintenance trucks. Brackets on one side, above the tool compartments, are usually provided, while a roller and clamping arrangement offers a worthwhile improvement for frequent use.

For street light and traffic control maintenance the ladder is a practical necessity, and raising and lowering an extension ladder becomes a major operation repeated many times during the day. It may also present a safety problem on a street with many automobiles passing. Truck mounted ladders and lift platforms of modern design cut to a fraction the time to set up and greatly re-



COMPLETE WORKSHOP LAYOUT. Replacement of trucks that have served through the war-shortage years will offer an opportunity to include the features illustrated in this example of a modern layout. A truck on normal utility service lasts ten years — many are now much older — and this use justifies careful planning for the particular job requirements.

Not shown on this layout are — Compartment for mobile radio equipment, Wire rack and wire reel, Vise bracket, Medical kit holder, Universal sheave and the Winch and several other details outlined elsewhere in this report.

duce the hazard of working over the street or obstructions.

Many trucks are used for the primary purpose of carrying a ladder, along with repair parts and tools for some particular maintenance work. Three principal types are available. Tower lifts for a large platform directly over the truck, or extended to one side; Aerial platform ladders for greater flexibility in the angle between truck and the overhead work; Lighter ladders for one man operation on a pick-up or other light model truck.

With gearing and mounting arrangements now available on standard ladders, one man can swing into position and extend the platform to the desired spot in a matter of seconds. For routine operations with the heavier ladders and lifts power from the truck engine, working through a pump and hydraulic hoist, can replace the manual operating mechanism.

Pole Hole Diggers

Perhaps the biggest labor-saver that has been designed for line construction trucks is the pole-hole digger. Because their value is highly functional, the diggers are usually mounted on a special truck designed to keep on the move. A derrick is integral with the borer and the complete truck unit takes position at the pole stake, bores the hole, and swings the pole into place. Special attention must be given to the truck for this operation, because of the ditches and many other obstructions necessarily encountered in moving to the exact location of every pole.

The conventional arrangement places the digger on the rear end of a truck. A more convenient layout for the operation results with the driver's cab and the digger side by side. The operator can then drive directly up to the stake and swing into action with a full view of his progress in opening the hole. For particularly bad right of way conditions, a crawler tractor may be necesarry to handle pole hole digging operations.

Trailers

Pole dinkeys have been used almost as long as there have been trucks to pull them, and two-wheel trailers were enlarged to carry cable reels long before truck bodies of the present type were in use. Full possibilities of trailers were realized much more recently however. Providing everything in the design range from an extension of the truck body tool storage facilities to a complete substation on wheels, the trailer has grown into its own place of functional importance.

Trailers have important advantages in three principal cases: (1) For hauling extra loads, as poles, cable reels, large transformers; (2) For special tool and material transport, as live line tools, substation construction equipment, etc., when they may be most conveniently left at the job site for several days to save daily hauling on the truck; (3) Special equipment, as oil filters, manhole cleaning pumps, emergency substations, etc., needed occasionally but not every day on the truck.

Several designs of live line tool trailers are available and they have won high favor because the storage space is especially arranged and protected for hot sticks, safety platforms, and other maintenance items. Following the same principles used in truck bodies, racks and compartments are provided to fit the tools, and the complete units are weatherproof. Heaters are available in these trailers, to keep the tools dry in storage. Similar special trailers

LIFT PLATFORM on a street-lamp maintenance workshop, complete with globe cleaning tank and supplies

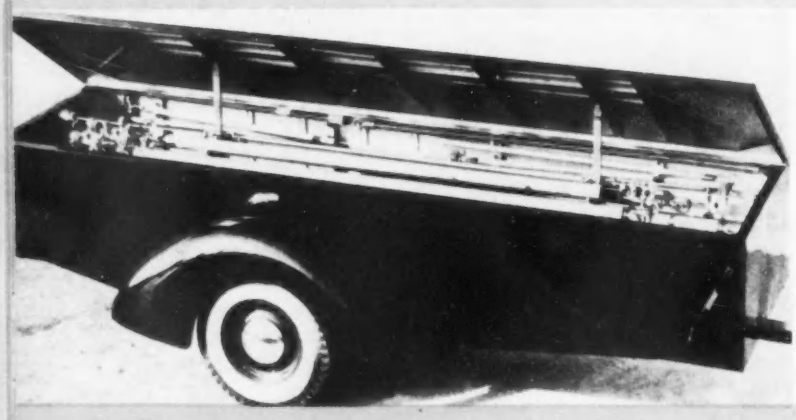
PARKED AUTOMOBILES are no problem to trucks of this type equipped with platform extension operated by a hand wheel

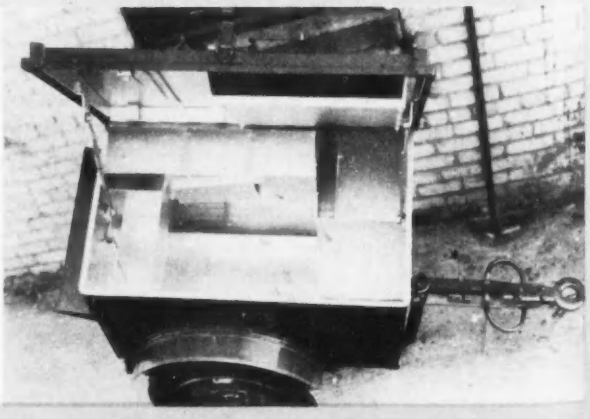
LIGHT LADDER on truck floor pedestal beats the ordinary extension ladder in both time and safety

with bodies designed for cable splicers tools are also extensively used.

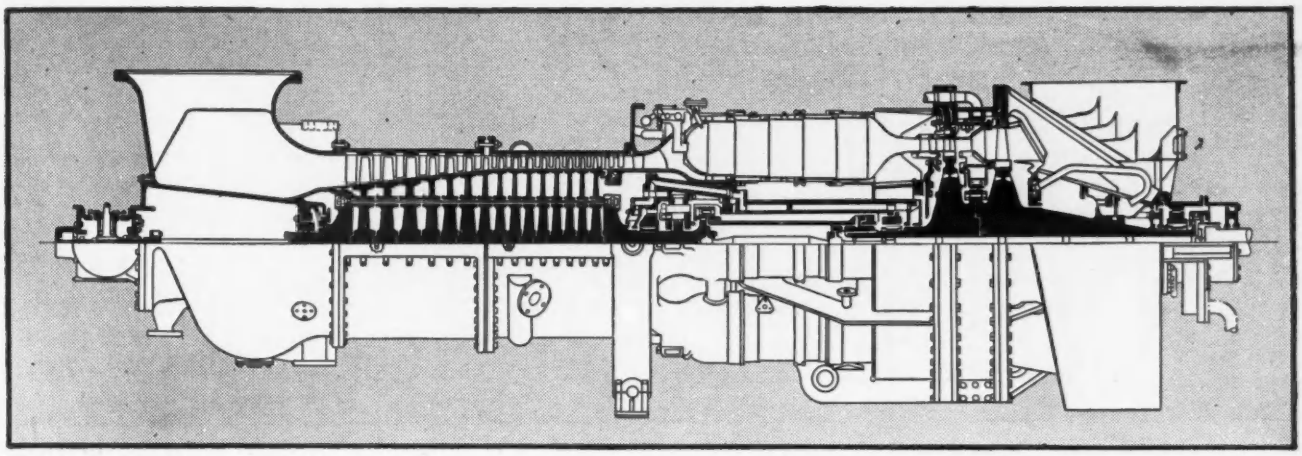
It is important that the use of trailers be anticipated in the truck and body layout, so that the necessary attachment for heavy pulling will be provided. A pintle hook, with a built-in recoil spring on the drawbar and with a safety catch, is desirable for regular use. Towing hooks, used for emergency pulling by the truck may lack essential safety features for long drives with the trailer.

HEAVIER LADDER contributes greatly to maximum flexibility in reaching across and around obstructions





LIVE LINE TOOLS are carried in special racks in this trailer . . . Cable splicer's cart (right) with 15 compartments for arranging all the special tools of this trade. A work bench is provided at one end of the trailer



GAS-TURBINE plant represents fundamental construction applicable to locomotive, stationary or special uses

Newest 4,800-Hp. Gas Turbine

ALAN HOWARD
General Electric Co.
Schenectady, N. Y.*

BASED on intensive war-time development of gas turbines for aviation, General Electric's first post-war general-purpose power unit, now ready for test, is a simple in-line assembly of compressor, combustion chambers and turbine designed to burn Bunker C oil. At 6,700 rpm. with 1,400 F. gas temperature, the unit can develop 4,800 shaft hp. at 1,500-ft. altitude with 80-F. ambient air, at an over-all thermal efficiency of 17 percent after losses and auxiliary use.

Some 15 axial-flow compressor stages pump 70,000 cfm. through the unit at a compression ratio of about six to one. Separate wheels are held together to form the rotor by through bolts. First six stages are aluminum alloy for light weight, others are 13-percent-chrome-steel machined from bar stock or forged. Blades are held in half rings by dovetails, assembled into a bolted stator, half aluminum and half steel to take higher temperatures. Extraction of air for turbine-wheel cooling is provided.

Six combustion chambers for heavy-oil firing resemble those of aircraft units. Outer casing of carbon steel incloses liner of stainless material about 3 ft. long and 10-in. dia. Air enters inner liner through annular slits, radial holes and through louvers so arranged that good combustion is possible over a wide load range. Air atomizing fuel nozzles take their supply from a small compressor at the front of the unit. Spark plugs ignite two of the combustion chambers, the remainder lighting off through cross-ignition tubes, found satisfactory in aircraft units. Bunker C fuel, cleaned by centrifuging or filtering, will be preheated to 200-300 F.

Two stages only of turbine, simple and compact, operate at a pitch-line temperature of 1,160 F. with 1,400 F. gas, about 200 F. lower than a corresponding eight-stage reaction turbine. High axial velocities result in a short, low-stress bucket, suitable for higher effective inlet temperatures.

High bucket velocities are compensated for by thick wheels of constant-stress design and of composite construction. Wheel rims of stainless steel suitable for high temperatures, surround a main central portion of low-alloy high-strength steel suitable for operation only below 700 F. Welded construction results in a wheel stronger at the center than if only high-temperature alloys were used and much stronger at the rim than low-alloy steel alone could stand. With this design, large turbines are possible.

Wheels are cooled by a small air flow bled into the space between wheels and adjacent stationary walls. Experience to date indicates no need for shrouding.

First-stage nozzles, welded into an outer ring, project through openings in an inner ring, forming a structure free to expand radially as much as ½ in. without pins or keys. Second-stage nozzle assembly is similar but split to allow assembly.

Tachometer, over-speed governor, fuel pump, air-atomizing compressor, lubricating-oil pump and fuel regulator are driven from an accessory gear box mounted forward of the unit. Fuel regulator maintains speed and power output, limits exhaust temperature, by varying piston stroke of the fuel pump. Temperature-sensitive devices in the exhaust duct prevent too high temperatures within the unit.

Partially automatic starting, at the discretion of the operator, requires about 100 hp. from an auxiliary diesel set or other means. Full automatic starting is anticipated.

The entire unit has been designed as simply as possible, based on study of economics of railway, industrial and utility application, the desirability of long life and adaptability to heavy fuel oils. Based on space, weight, cost of apparatus and fuel, it is quite conclusive that neither regenerator or other elaborations are justified for the intended service.

*From a paper before mid-summer convention of A.S.M.E., Chicago, June 16-19.

J. J. Dougherty, (ex-chairman Montreal section) Eastern Power Devices, Ltd.; A. G. Moore, consulting engineer, Montreal; K. W. Fraser, manager, Westinghouse Electric Corp. (of Canada), Montreal; C. H. Champion, International Paper Co.; H. W. Haberl, Hydroelectric Power Commission of Quebec, the latter vice-chairman of the committee of arrangements . . . H. S. Osborne, U. S. National Committee on Standardization; R. L. Jones, incoming chairman, A.I.E.E. Standards Committee; W. P. Dobson, Hydro-electric Power Commission of Ontario, and W. R. McCaffrey, director, Canadian Standards Association

A. I. E. E. Sessions Have

Annual summer general meeting discloses impediments to economic long-distance transmission, promotes hemisphere standardization and better protection of transformers and industrial circuits. Carrier and hydro systems, paper mills, gas-pressure relays, welding, industrial voltages other major topics

ISSUES prominent in Canadian practice along with an inter-continent flavor injected by discussion of international standardization stimulated some of the liveliest discussion at the annual summer general meeting of the American Institute of Electrical Engineers in Montreal June 9 to 13, 1947. Paper mill electrification, hydro operation and the extensive success with gas-pressure relays for transformer protection were among these topics. Others dealt with (1) the limitation of distance to which high voltage can transmit 50 percent load factor energy in competition with fuels, (2) with silicone insulation in transformers, (3) carrier traps, (4) selectivity of over-current trips for motor-circuit protection, and (5) the bettering of industrial system voltages.

Transmission and Distribution I

Electronic Stabilizer for Power Transmission. E. F. W. Alexanderson and D. C. Prince, both General Electric.

Alternator voltage controlled by manipulating supplementary reactive load. Fast response because of dependence on transient reactance.

The Probable Breakdown Voltage of Paper Dielectric Capacitors. H. Brooks, Westinghouse.

Expression derived for fortuitous inclusion of comparatively large conducting particles from mill operations.

Metering with Transformer-Loss Compensators. G. B. Schleicher, Phila. Elec.

Economy in low side measurement. Equipment exposure reduced. Space saved. No alteration of watthour meter. (See article in forthcoming issue).

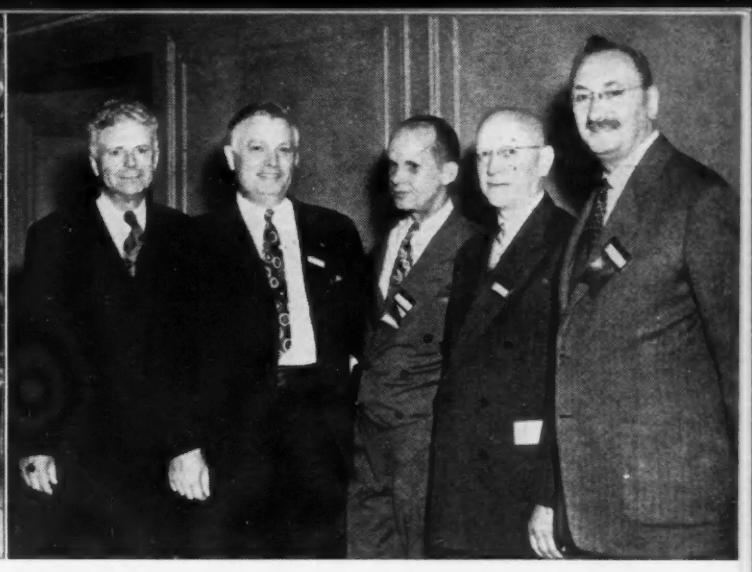
Galloping Conductors and a Method for Studying Them. E. L. Tornquist and C. Becker, both Pub. Serv. Co. of No. Ill.

Full-scale experimental line gives vigorous galloping at 7 to 10 mph. Theories of instability found inadequate.

Chairman Borgquist of the CIGRE executive committee (here from Sweden for a meeting of that group) raised the question of cost of the stabilizing reactors and of the added cost of 0.9 power factor generators as against the capacitive correction. He did acknowledge that the reactances would be needed to get a long high-voltage line (like the 600-km., 385-kv. line now initiated in Sweden) properly energized at no load. Losses in the proposed reactors and the generator would, he felt, not be too consequential in light of the gain in transmitted power promised by the Alexanderson-Prince scheme.

C. H. Willis of Princeton explained the long-line need for the variable reactor and said the combination of L and C affords a new means of excitation of induction generators as well as a way to attack both the reflection and stability problems posed by long lines.

In the Northwest the 500-mile lines under contemplation would, for stability reasons, have to be operated too far below economic loading if conventionally designed, said A. Dovjikov of Bonneville Power Administration. Even an electronic exciter is not fast enough. He construed the Alexanderson proposal to be one of providing appropriate internal voltages during transient disturbances and quickly, because of the fast response of the grid-controlled rectifiers employed between reactor phases. Dovjikov, too, raised the economic issue and feared the over-all costs (the rec-



L. D. Price, NEMA; Bror Svensson and Dr. A. Uno Lamm, ASEA of Sweden, and E. W. Boehne, MIT . . . George Sutherland, Consolidated Edison Co. of New York; Walker Cisler, Detroit Edison Co.; Tomlinson Fort, Westinghouse; E. T. Williamson, Iowa-Illinois G. & E. Co., and C. A. Powel, Westinghouse

International Flavor

tifiers apparently have to have ratings up to half the aggregate for the generators.) He suggested alternative consideration of (1) electronic exciters on generators of moderate reactance, (2) series capacitors, or (3) combinations as just as valid from the stability viewpoint. These, he believed, could permit transmission of amounts of power greater than the surge impedance loading of the circuit.

The reported scheme, said S. B. Crary (General Electric), affords a large increase in kilovars for a comparatively small drop in voltage. Some form of line compensation would still be needed for the long straight-away line, he said, adding that the idea would be particularly attractive wherever there is aversion to the capacitive procedure or where economics would dictate raising the stability capabilities of a single-circuit line.

A. U. Lamm (A.S.E.A., Sweden) considers that d.c. costs 30 percent less until terminals are added in, and expressed the belief that it promises an earlier solution of the long-distance transmission problem.

Transmission and Distribution II

Lightning and 60-cycle Power Tests on Wood-Pole Line Insulation. P. L. Bellaschi, Westinghouse.

Wood has considerable quenching ability; 100 poles tested; leakage and deionization warrant further study.

Economics of Long-Distance A.C. Power Transmission. S. B. Crary and I. B. Johnson, both Gen. Elec.

287-kv. optimum for 200 Mw. and 300 miles; 360 kv. for 300-600 miles and 300 Mw,; terminal transformer and 100-mile line costs equal. Mills per kw.-hr. at 450 kv. double 287 kv.

Lightning Investigation on the West Penn System. W. C. Bowen, West Penn Power **and E. Beck,** Westinghouse.

Two 10,000-amp. discharges; rises 5,500 amp. per ms.; 22,900 ms. duration; more than 23-kv. BIL in 93 percent of cases without protection; arresters of reduced rating economically justified for old equipment.

Performance of TVA 161-Kv. and 115-Kv. Transmission Lines. K. E. Hapgood and C. P. Almon Jr., both TVA.

All designed on direct-stroke theory; galvanizing good for 30 years; lightning outages average less than 4 per 100 mi. on 161 kv. and over 10 on 115 kv.; counterpoises efficacious, oscillographs beneficial. †

Economic rather than technical practicability was the dominant theme in this session and the discussions of the Crary-Johnson paper pointed in general in the direction indicated by D. C. Prince (General Electric) when he said that electric transmission engineers are facing stiffer competition from the gas and oil energy-delivery systems as long as they have to contemplate 50 percent load factor. E. E. George and R. E. Pierce (Ebasco Services) concurred after pointing out that the increased loading of transmission circuits has, temporarily at least, offset the increased investment costs.

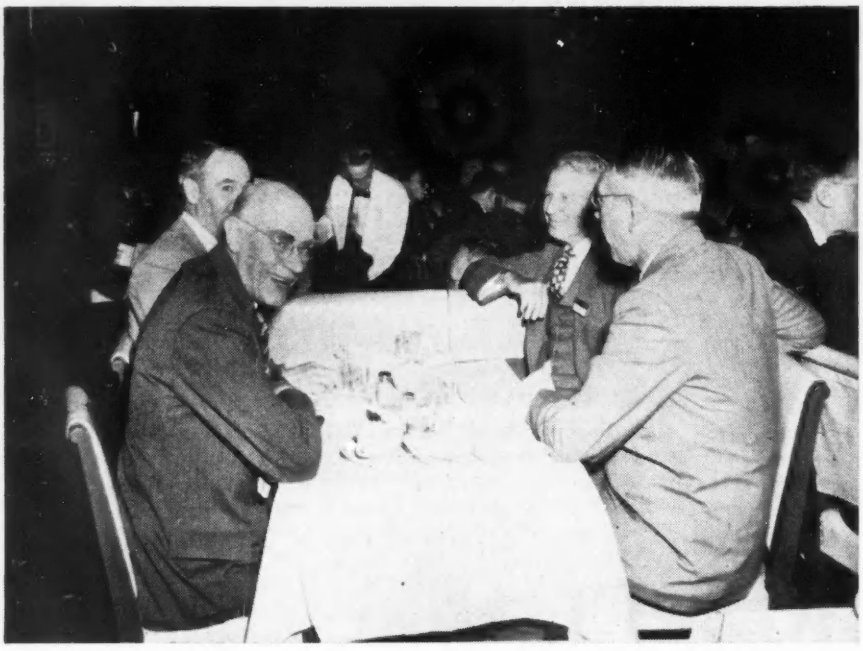
They showed numerous data on costs of transporting coal, gas and oil on charts which indicated greater electrical costs for distances of about 100 miles and more. They agreed with Crary and Johnson on their coal estimates but felt that gas and oil should be brought into the analysis.

A series of five slides showed that cost of electric transmission (50 percent L. F. and 11.5 percent F.C.) was greater than transporting gas under most circumstances and greater than transporting oil under any circumstances. If the load factor can be 100 percent the electric transmission costs are practically cut in half and the electric way then acquires definite advantage.

Lightning

Three lightning papers continued the literature of authentic articles which Chairman I. W. Gross said had been averaging 50 good papers a year, one a week, for 20 years. Bellaschi, in launching his presentation, said the young engineer could find plenty of glamor in clarifying the issues still unsolved.

In discussing the Bellaschi paper both F. E. Andrews (Public Service of No. Ill.) and H. N. Ekvall (Philadelphia Electric) expressed the belief that greater ionization of heavy, multiple and prolonged strokes should predispose power-follow to a greater extent than the single impulse em-



G. M. Armbrust, Chicago; N. G. Pearcy, Utility Engineering and Management Corp.; W. G. Kelley, Commonwealth Edison Co., and Andrew Gardner, Okonite

ployed in the paper. Both J. T. Lusignan (Ohio Brass) and F. O. McMillan (Oregon State) said that moisture *in* rather than *on* the wood is what controls, the latter stressing the degree of penetration. H. L. Melvin (Ebasco Services) commented that the design and choice of wood for insulation is important if damage is to be minimized and that test data, operating experience and the wood itself must all be applied intelligently.

Concerning the Bowen-Beck paper, Victor Siegfried (American Steel & Wire) hazarded the opinion that anomalous fuse blowing can be attributed to the sharp increase in magnetizing current accompanying the saturation of transformer cores by the d.c. component of a long surge.

Reduction of outages at higher voltages, loading beyond surge impedance levels and the merit of polyphase high-speed reclosing were read out of the TVA paper by Crary. He said the data reported indicate possible further reduction in insulation levels, particularly at and above 220 kv.

Hydroelectric Generation

The Maintenance of Hydroelectric Generating Units. A. S. Robertson and R. O. Standing, both Hydro-Elec. Power Comm. of Ont.

Vacuum drying, Bakelite treatment of field coils, welding a cracked shaft, thrust bearing maintenance.

Hydroelectric Power Development in Quebec. F. L. Lawton, Alum. Co. of Can.

No steam; 4,000,000 kw. hydro. History and statistics of developments, loads, ties and operating exigencies.

The German Electrical Utility Industry During World War II. J. G. Noest, Consol. Edison Co. of N. Y.

Resume of bureaucratic administration, departures from U.S.A. practice, significance of war-time deferred maintenance and damage.

Factors in the Economic Supply of Energy in Hydroelectric Systems. A. H. Frampton and G. D. Floyd, both H. E. P. C. of Ont.

Control of stream flow; hydraulic efficiencies; utilization of storage; provision of peak reserve; advantageous disposal of energy.

C. P. Almon, Jr., of TVA noted that the cost factors of the Frampton-Floyd paper had been set up for a system completely hydro, and that with steam capacity included, factors other than cost became involved. W. L. Meany, General Electric, noted that automatic frequency control has become a necessity, whether applied to one unit of a complex system or to several or all. Where all machines are controlled, he observed, tie-line fluctuations were reduced to a minimum and most efficient over-all economy by holding all units near their best gate. On occasions when units operate wide open to avoid spilling, frequency can be held by other machines.

F. L. Lawton, Aluminum Co. of Canada, argued against holding any water over from one year to the next but suggested more study of long-term weather cycles and application of probability theories to hydro operations. C. K. Duff, Hydroelectric Power Commission of Ontario, noted that the paper might be misconstrued to blame the automatic frequency control for inefficient loading, and that the basic cause of operating at other than best gate traces back to variation in consumer demand. With automatic frequency control, he added, ties can be scheduled up to full capacity of the ties and load control problems for each unit of the system become exactly the same as if they were operating separate local systems without ties. Automatic frequency control permits operation of units at higher loads than manual control.

The Robertson-Standing paper evoked comment that babbitt has a definite fatigue life and that any element which increased duty would shorten life. It has become regular practice to assure uniform stress in thrust springs by adjusting their length. Almon reported best success with tight thrust collars.

After John Noest's report of Germany's utility war record, K. B. McClure of General Electric observed that standardization had progressed more rapidly in Germany than here. In the early '30's their newer generators had short-circuit ratios of 0.5 and they were able to increase output some 7 percent in 1942 partly because of this standardization.

Robert Treat, General Electric, remarked on the fact that Noest's curves showed the German system unable to carry war loads toward the end of 1942 without any appreciable loss of capacity from bombing, and that by May of 1944 the amount of unavailable capacity grew rapidly. He ventured the question as to whether at this time the ball-bearing, synthetic gasoline and transportation industries were best targets for air attack, presenting this for study in the hoped-against eventuality of another war.

C. W. Mayott of Hartford Electric Light reported that the Germans failed to pool their electricity supplies as was done so successfully in this country. We operated, he wrote, areas and capacities larger than all Germany's with but nominal advice from Office of War Utilities personnel, who were

themselves drawn from the utility industry. He also noted that Germany could not complete her large hydro program in time to be of war use, as would undoubtedly have been the case here if we had undertaken the very great water-power program proposed by some authorities early in the war period.

Paper Mill Power

Automatic Operation of Electric Boilers. M. Eaton, Shawinigan Chemicals, Ltd.

Aggregate 2,000,000 kw. mostly automatically controlled. Terminology, classification and selection of controls;—air-operated, conductivity, water-level, surge-tank.

In a conference paper, A. P. Schnyder of George F. Hardy & Son, Consulting Engineers, pointed out that the paper industry's power consumption of 11.5 billion kw.-hr. in 1945 ranks this division in fourth place among manufacturing industries in consumption of electric power. While this represents more than 4 percent of total electricity production, and totals more than 1.5 million kw. demand, only about a fourth of the power is supplied by utilities.

Some definite advantages to utilities as well as the paper companies have resulted from interconnection, he added, with feed in both directions through the tie so that the paper plant buys condensing power from the utility above the "byproduct" level, but returns any excess at times of non-coincident steam and electric demands. Certain operations, such as large-power grinders, can be scheduled for Sunday operation to take advantage of dump hydro energy.

Another conference paper by G. M. McHenry and J. L. McKeever of Canadian General Electric Co. encouraged high-voltage distribution systems for paper mills at 13.2 or 4.2 kv. While 2,300-v. motors appear most economical, the authors note, often the total costs of power supply are reduced by use of higher voltage distribution, notably 4.2 kv., because of switchgear and cable costs. Broadly, the authors recommend supply at 460 or 575 volts for plants up to 2,000 kva., 4.2 kv. for loads from 2,000 to 10,000 kva. (with a permissible upper limit of 20,000 kva. for expansion), 6.9 kv. for systems between 10,000 and 20,000 kva., and 13.8 kv. for any mill above 20,000 kva. at time of construction or eventually to be expanded above this size.

R. G. Warner, United Illuminating Co.; L. W. Smith, Doble Engineering; M. S. Gifford, Memphis, Tenn.; R. J. Wensley, Charlotte, Mich., in the Normandie Room watching the smoker entertainment

Paper Mill Equipment

The Application of Synchronous and Induction Motors to Chippers. R. R. Baker and M. R. Lory, both Westinghouse.

Analyzes chipper duty; synchronous motors customary above 110-in.; automatic field control desirable for maximum output.

Electrical Equipment in the Finishing Room. F. Winterburn, Howard Smith Paper Mills, Ltd.

Wound rotor motors generally for super-calenders, cutters, platers, embossing, coating (or d.c.); squirrel cage for trimmers and conditioners.

A conference paper on paper-machine drive by H. W. Rogers of General Electric describes a quarter century of progress in the problem of controlling speed of the paper as it passes from a condition of 199 parts water and one part pulp to a final 7 percent moisture condition on the finished roll. Each section of the machine must be driven slightly faster than the preceding rolls to elongate the paper from 6 to 10 percent. Speeds must be maintained with extreme accuracy, in the order of 0.05 percent. Progressing from cone-pulley mechanical controls, the author outlined, through several stages of auxiliary synchronous motor tie-ins, synchronous regulators and early electronic speed regulators, designs now available for multi-generator (direct current) drives with amplidyne control suitable for high-speed paper machines. This drive, the author noted, far surpasses anything yet available to the industry in flexibility, ability to start or stop any part of the machine, and eliminate effects of external disturbances transmitted from one section of the machine to another.

John Fuller, Reliance Electric & Mfg. Co., commented that the single generator drives of recent types, with booster motors, can drive at slow speeds for wash-up without main drive elements and afford equal accuracy of speed control.

W. L. Eliason of Ontario Paper Co. and John Eyton, Abitibi Power and Paper Co., presented joint conference papers on electrical maintenance in the paper mill. Both emphasized necessity for planned maintenance programs and periodic checks of motor operation as well as control and switchgear.

Protective Devices

Relay Protection of Power Transformers. A.I.E.E. Relay Subcomm.

Three-year survey of 14-year progress; problems of magnetizing inrush, fuse alternative, promise seen in pressure protection, gas accumulator relays believed underestimated.

Selective Tripping of Low-Voltage Air Circuit Breakers. William Deans, I-T-E Circuit Breaker Co.

T. J. Little, Anaconda Wire & Cable Co., and C. F. Ferrell, Puget Sound Power & Light Co.

As an alternative to cascading, sequential delayed tripping provides long-time delay on over-current and very short time delay on faults, breakers modified accordingly.

A Development in 5,000-Volt Metal-Clad Switchgear. R. G. Lockett and J. D. Wood, both I-T-E.

Simplified contact assembly, compact arc chute, no flexible connector at hinge, integral part of metal-clad gear.

An Improved Overcurrent Tripping Device for Low-Voltage Circuit Breakers. H. L. Rawlins and J. Sandin, both Westinghouse.

Positive displacement of fluid in hermetically sealed chamber; bypass for short times. Applicable to d.c. or a.c. breakers.

Performance Criteria of D C. Interrupters. E. W. Boehne, M.I.T. and M. J. Jang, Gen. Elec.

Mathematical analysis indicates quick break and rapid transfer to arc suppression chamber and a more accurate severity standard.

Much of the discussion on the relay subcommittee's report focussed on the gas pressure relay. F. L. Lawton (Aluminum Co. of Canada) reported that experience with the Bucholz type shows competency in detecting incipient faults in transformers. Identification of the accumulated gas averts disassembling after a trip-off. E. L. Harder (Westinghouse) asserted that the trend is toward a complete demarcation between differential and thermal times and magnitudes with no restrictive coordination then necessary. A. M. Doyle (Canadian General Electric) said that since 1939 there had been some 600 modified Bucholz relays installed in Canada on transformers up to 50,000 kva.

Discussion of the Deans and Rawlins papers emphasized the limitations of prevailing forms of overcurrent tripping devices and the need for providing selectivity on the lower values of fault current, in fact over a wider range of fault current than now generally obtainable.

Industrial Voltage

Report on Industrial Voltage Requirements. A.I.E.E. Committee.

Recommendations for voltage spread, transformer voltage ratings and taps comparable to the E.E.I-NEMA "Preferred Voltage Ratings."

Data on the High-Frequency Resistance of Coils. W. F. Witzig, Westinghouse.

Methods devised for flatstrap coils (approximate) and tubing coils (short empirical procedure) including effect of wall thickness.

Dielectric Heating, the Measurement of Loss Under Rising Temperature. J. B. Whitehead, The Johns Hopkins Univ.

D.c. heaters employed to simulate the a.c. heating phenomena.

Electric Furnace Practice in Canada. J. L. Balleny, Can. Gen. Elec.

Continuous steel strip annealing (1,680 kw.); wire "patenting" by conduction heating (129 kw. for bath); aluminum alloy heat treatment; malleable annealing; induction heating for forging and hardening.

High-Frequency Heating in the Radio Spectrum. W. C. Rudd, Induction Heating Corp.

Discusses prevention of radio interference, available frequency brackets, field intensities and operating procedures.

Because of the big difference in voltage drop between distribution systems of (1) the load-center type and (2) conventional step-down transformers supplying all or a large part of a plant, commented H. M. Jalonack of General Electric, it is obvious that voltage-ratio requirements of the two transformer types will be different; nevertheless, standardization and paralleling requirements indicate that a common set of secondary voltage ratings apply wherever reasonably possible. Once certain practical compromises are accepted, he added, rapid progress will be made toward standardizing transformers with respect to secondary voltage ratings.

To the suggestion in the Committee report that "transformer nameplates should state that voltage ratings are *no-load* values," Jalonack replied for the transformer manufacturers that identifying the low-voltage rating as no-load voltage would not be in accordance with American Standards Association practice and would rather complicate the nameplate without greatly helping the industrial user. Rather, he suggested, it would be possible and practical to cover this situation thoroughly in the instruction books, ASA C-57 standards, and the NEMA handbook. Another suggestion of the report to identify taps as full rated kva. on the nameplate is receiving consideration by a joint committee.

Ratio Changes

Changing the ratio on long-established standard transformers, he continued, has met strenuous objections, but it would appear, for example, that 7,200-v. rating with two 2½ percent taps above and two 2½ percent taps below normal would meet most conditions. It may, however, be necessary to build transformers with desired ratios, but it may not be possible to classify such units as standard.

To the suggestion that small industrial lighting transformers, largely dry-type, have their high-voltage side rated 230,460 or 575 volts, Jalonack anticipated careful consideration by the specialty transformer group.

Considering the over-all picture, he continued, it does not seem that standardizing on Y-connected secondaries for low-voltage circuits can be justified for all cases since the Y-connected units are more costly because of their higher current ratings. However, it is believed that the advantages and disadvantages of neutral grounding on the low side of industrial units should be carefully studied to see if the higher cost can be justified.

International Standardization

On Definitions of Magnitudes Characterizing the Behavior of Circuit Breakers Under Abnormal Conditions in American and Other Standards. S. Gerszononwicz, Univ. of Montevideo, Uru.

Emphasizes U.S.A. departures as to rated interrupting current, recovery voltage, interrupting time, duty, kva., making current, and urges uniformity.

Effective international organization for standardization can only be achieved, said Gen. Donald Armstrong of A.S.A., if the individual national standardizing bodies are strong. He urged that the A.S.A. be further strengthened and democratized

against the day when circumstances may prompt even more governmental controls than have recently been imposed. A budget of $1,000,000 was foreseen by him as indicated by growing requirements. There are 22 countries already participating in the I.S.O.; standardization over both Americas is one sound way of consolidating the hemisphere's industrial and military strength. He concluded by indicating that sustained interest in the I.E.C. is a mainstay of I.S.O.

Some of the projects of the U. S. National Committee of the I.E.C. are slated for transfer to I.S.O., said Vice-Chairman H. S. Osborne in reviewing the recent history and scope. Affiliation hinges upon certain matters of preserved identity and averted duplication. Somewhat similar questions are deterring the Canadian Standards Association, according to Director W. R. McCaffrey. Concerning importation of foreign goods, he averred that safety cannot yield to sentiment or expediency in accepting substandard foreign goods produced under badly disorganized conditions of production and inspection.

Carrier Currents

A New Single Side-Band Carrier System for Power Lines. B. E. Lenehan, Westinghouse.

Transmits only one group of dual set arising in frequency modulation; 9-element filter and phase-splitter produces quadrature components.

TVA Coordinated Communication System. T. D. Talmage, TVA.

2,500 miles of power line provide 1,500 miles of carrier telemetering, 2,500 miles of pilot channels and 3,263 miles of carrier telephone; 101 frequencies are used; 2,500,000 telephone messages a year.

Operation of Power Line Carrier Channels. H. W. Lensner, Westinghouse.

Rudiments of carrier; application analysis; operating checks; application to cables, low impedance and mismatch problems.

Supplementary details of the traps, a large factor in the effectiveness of TVA's carrier, were given by R. G. Obrecht in discussion of the comprehensive Talmage paper. There are two sizes, 400 and 800 amp., designed for versatile mounting and built to withstand 15,000 and 20,000 short-circuit amp. Impedances vary from 8,000 to 30,000 ohms and they provide a band-width of about 6 kc., each capable of tuning to block two frequencies. Switching, said W. E. Duncan (TVA), upsets the carrier unless traps are intelligently applied and placed. A second factor is the use of automatic volume control in the receivers.

Multi-use of carrier may decrease the reliability of relaying, said Mario Charles of TVA. E. W. Kenefake (General Electric) hoped Talmage would disclose the principles of selecting and spacing such a large number of frequencies on a single system. E. E. George (Ebasco Services) said it was incongruous to have two separate, uncoordinated telephone systems in a power plant but Talmage held that such separation may aid reliability. The latter added that TVA carrier is being expanded by half and that full trapping permits shifts and addition of frequencies.

Low cost capacitors and traps are fostering the growing usefulness of carrier on distribution systems for telemetering, remote control and mobile communication, said S. Lubin (Sprague).

Transformer Design

Silicone Insulation as Applied to Naval Electrical Power Equipment. H. P. Walker, Bureau of Ships, U.S.N.

Records evolutionary tests completed and in progress for laminated and molded insulations, including toxicity, commutation troubles, enamels, arc resistance.

Preliminary Report on Laboratory Aging Tests on Class A Insulation. Subcomm. on Transformers.

Tensile strength, elongation, folding tests, oil color, oil acidity data tabulated.

High-Voltage Power Transmission Design —Part II. M. B. Mallett, English Elec. Co. of Can.

New porous insulating cylinder of rag fiber; novel tank for shipping 230-kv. unit has sub-base on end- and side-walls.

Typical Transformer Faults and Gas Detector Relay Protection. J. T. Madill, Alum. Co. of Can.

Case for gas pressure relay based on faults attributed to (1) arc tracking, (2) constructed circulation, (3) foreign metals, (4) tap-changer defects, (5) high-resistance joints, (6) weakened insulation. "For detecting core trouble, nothing can even approximate the value of the gas detector relay."

M. L. Manning of Kuhlman Electric Co. supplemented the Walker paper with a report of 3-kva. transformers with silicone insulation and magnesium cases weighing only 45 lb. These have a great overload capacity and perhaps point the way to future dry-type distribution units. A. E. Lorraine, General Electric, noted that tests show two added factors, that the mechanical properties of silicones change with temperature which may limit hot-spot temperatures somewhat, and that ionizable contaminants on the surface of the insulation can enter physical irregularities of that surface and change the characteristics of the insulation. He also warned that temperature creep may aggravate the high-temperature deterioration rate.

Another commentator reported that a Class B insulated transformer failed after 3,700 hours at 200 C. while a silicone insulated unit gave longer service at 300 C. He suggested a factor of at least ten for life at the same operating temperatures. He further indicated the rotating machinery ball bearings could be operated up to perhaps 125 C. with silicone greases.

Resistance Welding

W. W. Brumby of English Electric Co., in a conference paper, reported that a vast amount of research on resistance welding was in progress in U.S.A. and Canada, including such items as further development of interlocking relays, applications of series capacitors, frequency transmutations to put single-phase welding on the line as three-phase loads, energy storage, operation directly from 2,300-v. lines and reduced inductance of secondary loops.

W. R. McKay, distribution engineer for Shawinigan Water & Power Co., detailed a case history of adding a 250-kva. seam welder to a rural system fed by a 600-kva. sub already loaded to about 400 kva. Sub supply came ten miles over a 30-kv. line, backed up by two 60-kv. circuits about 75 miles long. The welder peak runs to 350 kva. intermittently, on three cycles and off four, giving a flicker frequency of about seven cycles. With the existing transformer and distribution system this would cause about 2 percent flicker voltage where usual limits had been set at ½ percent.

Among the possibilities was increasing capacity of substation to 1,500 kva, installing a new feeder to the welder for power loads only. To increase the capacity of the 10-mile 30-kv. line and transformers back to the 60-kv. system would cost upwards of $60,000. Another alternate would be to bring the 30-kv. line right to the plant and step down in a separate substation.

HOW

DESIGN • CONSTRUCT • OPERATE • MAINTAIN

ANTISEPTIC SOLUTION is used to clean workmen's boots. Drying is accomplished with compressed air on this special rack, details of which are shown at right. Graduated sizes of the holes insure equal flow of air from the six tubes

Boots Treated Antiseptically

T. G. HIERONYMUS
Underground Superintendent
Kansas City Power & Light Co.
Kansas City, Mo.

Boots furnished to the men for work in mud or in placing concrete, etc., can not always be assigned to the same individuals and frequent cleaning is therefore advisable to prevent spread of athlete's foot or other troubles. An antiseptic solution for washing and a dryer which we designed are used for thorough cleaning. The results of the process have been gratifying.

The boots are first washed with hose water to remove mud. A 1 percent solution of Mer-Kil antiseptic is then poured into one boot, filling it to the top. After standing for five minutes the antiseptic is poured into the second boot and so on until all boots have been cleaned. There is no deterioration in the strength of the solution.

Thin wall steel tubing was used for the dryer rack, which is connected to the air compressor. As shown in one of the accompanying illustrations, it was found necessary to graduate the sizes of the outlet holes to give equal air flow from each tube. Wooden plugs were driven into the ends of the tubes and drilled, with the smallest hole at the end away from the compressor.

Drying requires about five minutes for each boot on this rack.

• • •

Insuring Safer Overhead Practice

Recent analysis of conditions on transmission systems potentially capable of causing accidents to the public offer utilities several practical preventive suggestions. Tower signs on high-tension circuits are often used by hunters as targets or mutilated by children throwing stones. More attention to signs by line patrols and prompt reporting of replacement needs are essential. Good practice is to provide a warning sign facing each direction from which a tower may be approached, so that there will be no excuse for a trespasser's failure to see a sign. High legibility is vitally important, according to the engineering department of the Liberty Mutual Insurance Co., of Boston, which has lately prepared a series of slide films, "Danger—High Voltage," showing a number of typical cases (unidentified) closely allied to accident prevention on both transmission and distri-

bution systems of electrical utilities.

A distribution system pole set in 1916 presented little or no accident hazard until some years later the street grade at this location was raised, bringing the earth around the pole higher than the original level. This unforeseen shift in conditions brought the height of the first pole step to less than 6 ft. above ground, making it easy to climb the pole without any special means. Removing the lower steps was indicated as the desirable procedure.

In another serious case a fatality occurred on a joint pole with primary line, buck arms and telephone cable. The pole was irregularly stepped up to the telephone cable, the steps being of different types used by the power and communication companies. A step only 6 ft. 4 in. above ground had been driven into the pole where no hole had been bored for a step. The accident victim was an 11-year-old boy who came in contact with primary and neutral wires.

Inadequate clearance between primaries and a steel bridge (the National Electrical Safety Code gives detailed specifications for clearance, calling for 3 ft. minimum where open-wire primaries pass a bridge) led to a serious accident. The stream under the bridge was "the old swimmin' hole" for the boys in the rural community, who had climbed the bridge for years and used the top as a diving platform. A 17-year youth thus engaged came in contact with a primary conductor in a span over the stream. The span was low enough to be reached readily from the bridge, and one wire was sagged considerably below the level of the others.

A bad accident occurred on a steel bridge on which a small structure had been erected to support a 4.8-kv. primary circuit crossing the river below. A boy grasped a primary wire with his wet-mittened hand and was knocked to the street below, losing several fingers on one hand though escaping with his life from this accident.

• • •

Amphibious Jeep Gets Peace-Time Patrol Job

OVER LAND AND SEA will go this latest patrol wagon for transmission and distribution line use. A road license and a marine permit are needed

CONVERTED to the particular needs of utility line operation, a regular army model amphibious jeep has recently been placed in service by Gulf States Utilities Co., Beaumont, Tex. With the many rivers, bayous, lakes and bays in the system, this piece of automotive equipment is expected to save much time in construction and maintenance work. The army-model conveyance has been made more comfortable for patrol in rain and cold by the addition of a frame, top and curtains.

• • •

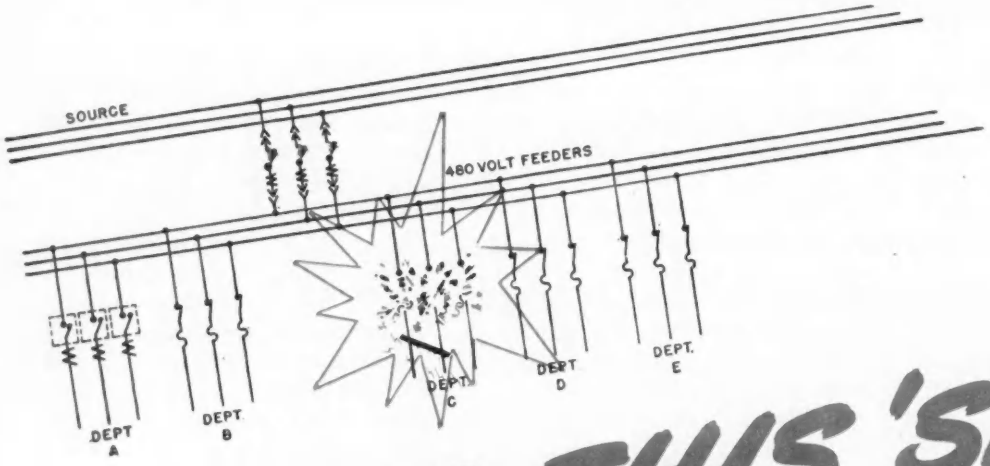
A Procedure for Testing Mechanical Demand Meters

FOR direct-connected type and contact-operated type of demand meters, a test procedure has been prepared by American Gas and Electric Service Corp., New York, N. Y. Since demand meters are an important part of the meter installation, they should always be tested and adjusted in the shop before installation and they should be tested periodically on the same schedules as the watthour meters with which they work.

Modern mechanical demand meters and demand attachments should be substituted at least once in every 3 years and brought into the shop for thorough overhaul and adjustment. The older types of registers and recorders may require a more frequent schedule in order to obtain satisfactory operation. In general it is neither economical nor practical to overhaul and adjust recording and indicating demand attachments in service.

A test should be made for time interval as well as indication since the accuracy is equally dependent on the time. The time interval should be checked with a stop watch or some other reliable timer from start to set-back. Checking the time driving element does not give a check on the interval and this means of checking should not be used to obtain accuracy. However, it is convenient in adjusting some types of demand meters, particularly demand attachments, to take short checks by timing the motor time element. If this is done, a complete interval check should be made after adjustment.

Demand meters of the type that are incorporated in the register, or geared directly to the watthour meter such as the Westinghouse type RA, may be conveniently tested for indication by counting the total number of revolutions of the watthour meter in a demand interval. It is not necessary to run the watthour meter for the full interval. The time check may be made at the same time by use of a stop watch or equivalent. The stop watch should be started when the demand mechanism cuts in. Then the watthour meter may be started and the revolutions counted. The watthour meter should be run enough to get about 50 percent scale indication on the demand meter and should be stopped before the demand sets back. The stop watch would be stopped when the demand sets back. In the



COULD THIS 'SHORT'

In this particular industrial plant little attention had been given to the "IC" of the protective devices on branch circuits. Although the machines in Dept. C had frequently "lost power" (at a considerable annual cost) the shop electrician had been able to resume power by means of replaceable parts (another uneconomical factor).

One day a "short" of tremendous magnitude in Dept. C blew out the "protective" device. This was equivalent to a bus fault, and was not cleared until the power company's circuit breaker opened. Not only was Dept. C shut down, but also Depts. A, B, D, and E—loss of production of the entire plant (estimated at $1000 an hour) was caused by a fault that could have been confined to one branch circuit.

Inquiry showed that the transformer capacity supplying the circuit had been increased from 300 to 750 kva to provide for increased production. The "IC" of the protective devices had been inadequate before—and with the increased capacity they were seriously deficient.

As the table below shows, a device with an "IC" of 25,000 amperes was needed. Circled is the G-E air circuit breaker that would have *adequately* interrupted any possible short circuit.*

INTERRUPTING RATINGS—G-E AIR CIRCUIT BREAKERS TO USE

Transformer Capacity in Three-phase Kva	220-240 CIRCUIT VOLTAGE		440-480 CIRCUIT VOLTAGE		550-600 CIRCUIT VOLTAGE	
	Main Breaker	Branch-feeder Breaker †	Main Breaker	Branch-feeder Breaker †	Main Breaker	Branch-feeder Breaker †
300	50,000 AL-2-50	25,000 AE-1-25	25,000 AE-1-25	15,000 AE-1-15	25,000 AE-1-25	15,000 AE-1-15
500	50,000 AL-2-50	50,000 AL-2-50	50,000 AL-2-50	25,000 AE-1-25	25,000 AE-1-25	15,000 AE-1-15
750	75,000 AL-2-75	50,000 AL-2-50	50,000 AL-2-50	(25,000 AE-1-25)	50,000 AL-2-50	25,000 AE-1-25
1000	75,000 AL-2-75	75,000 AL-2-75	50,000 AL-2-50	50,000 AL-2-50	50,000 AL-2-50	50,000 AL-2-50
1500	.....	.....	75,000 AL-2-75	75,000 AL-2-75	50,000 AL-2-50	50,000 AL-2-50
2000	.....	.....	100,000 AL-2-100	100,000 AL-2-100	75,000 AL-2-75	75,000 AL-2-75
2500	.....	.....	100,000 AL-2-100	100,000 AL-2-100	100,000 AL-2-100	100,000 AL-2-100
3000	.....	.....	.....	.....	100,000 AL-2-100	100,000 AL-2-100

* The table is based on unlimited power supply and 5 per cent transformer impedance.

† If cascading of feeder breakers is used, it is possible that a smaller breaker may be used for branch-feeder service.

COST YOUR PLANT $1000 AN HOUR?

NOT IF YOU MAKE SURE OF YOUR 'IC'

(Interrupting Capacity)

HERE'S HOW . . .

KNOW THE "IC" OF YOUR LOW-VOLTAGE PROTECTIVE DEVICES

The "IC" (interrupting capacity) of a circuit breaker or other interrupting device is the maximum current it is rated to *adequately* interrupt. It is essential that you know the "IC" of your protective devices.

BE SURE THE "IC" IS ADEQUATE TO INTERRUPT MAXIMUM SHORT-CIRCUIT CURRENTS

Maximum short-circuit current is *not* determined by the normal load on the circuit. The total capacity of the transformers feeding the circuit is the critical factor. In the adjoining table, check your transformer capacity against the "IC" corresponding to your particular circuit voltage. The "IC" of your protective devices should be equal to or greater than the short-circuit currents available as determined by your transformer capacity.

IF YOU NEED MORE "IC", INSTALL G-E AIR CIRCUIT BREAKERS

It's easy to select the proper G-E air circuit breaker from the table. And you can be sure they have adequate "IC" to safeguard your production, equipment, and personnel. By providing three-phase interruption of dangerous overcurrents, G-E breakers eliminate the possibility of single-phasing damage to motors. Workmen can operate these breakers easily and safely. A turn of the handle and power is restored—no parts to be replaced.

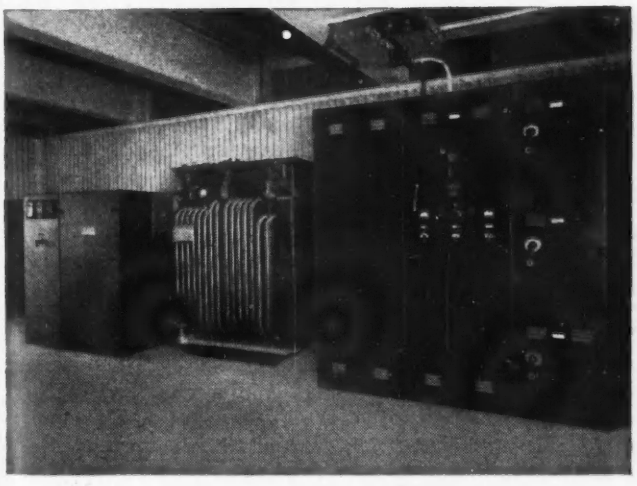
Write for the bulletins listed below, or contact your G-E sales representative. *Apparatus Department, General Electric Company, Schenectady 5, N. Y.*

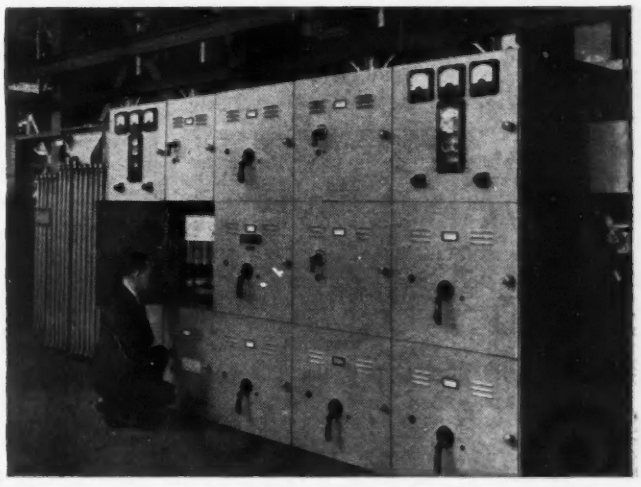
GEA-3600 Air Circuit Breakers

GET-1113 The Selection and Application of Air Breakers

GEA-3592 Load-center Unit Substations

GEA-2596 Low-voltage Drawout Breaker Equipment





G-E air circuit breakers are available not only as individual wall-mounted units, but also as an integral part of complete load-center unit substations.

GENERAL ELECTRIC

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case of a time-lagged demand meter it is, of course, necessary to run the meter continually for the full time interval.

Indication accuracy using the above method would be:

$$\text{Required Indication} = \frac{\text{Revolutions} \times \text{Meter Disk } K \times 3600}{\text{Nominal Demand Interval in Seconds}}$$

$$\text{Indication \% Accuracy} = \frac{\text{Obtained Indication} \times 100}{\text{Required Indication}}$$

Time interval accuracy would be:

$$\text{Time \% Accuracy} = \frac{\text{Seconds Interval Obtained} \times 100}{\text{Seconds I nterval Required}}$$

Over-all accuracy of the demand meter would be:

$$\text{Over-all \% Accuracy} = \frac{\left(\begin{matrix}\text{Indication \%}\\ \text{Accuracy}\end{matrix}\right) \times \left(\begin{matrix}\text{Time \%}\\ \text{Accuracy}\end{matrix}\right)}{100}$$

The class of demand meters operated by contacts, which include such meters as G.E. Co. types G, M and P, should operate 100 percent on indication or in other words should register on every impulse from the contacting device. This operation can readily be checked by operating the contacting device by hand or by running the watthour meter and counting the revolutions, in which case the number of contacts received would be:

$$\text{No. of Contacts} = \frac{\text{Revolutions Run}}{\text{Rev. Required to make one Contact}}$$

The time interval should be checked with a stop watch or equivalent, from time mechanism cuts in, until it trips out. If demand meter is a Printometer type, the time would be controlled by a contacting clock and this clock should be tested and in addition the operation of tripping and setting mechanism should be checked. The accuracy of the demand meter due to error in the time interval would be:

$$\text{\% Accuracy} = \frac{\text{Seconds interval obtained} \times 100}{\text{Seconds interval required}}$$

Since the meter should always be 100 percent on contact operation to be usable, the over-all accuracy would be the same as the accuracy of the time component or

$$\text{Over-all Accuracy} = \frac{\text{Time \% Accuracy} \times 100\%}{100}$$

When contact-operated demand meters are being tested in service a thorough inspection should be made of the contact device on the watthour meter.

For making a test run in the shop on a contact-operated demand meter a motor-operated contact device may be used.

The limits of error for both direct-connected and contact-operated demand meters shall not be greater than that stipulated by the State Public Utility Commission having jurisdiction and in no case shall be greater than shown in following table.

	Direct-Connected Demand Meters	Contact-Operated Demand Meters
Indication.....	1.	0
Time.....	1.5	1.5

The percent error of a demand meter is based on full scale reading.

• • •

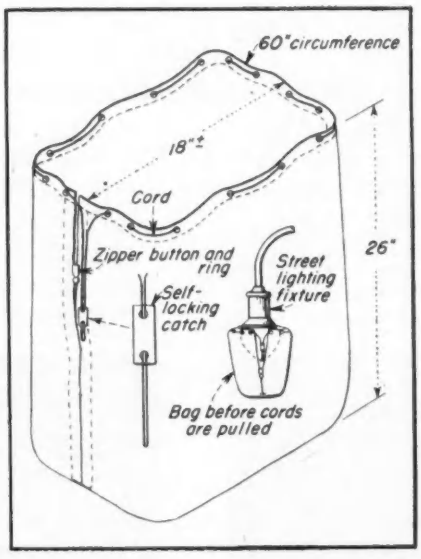
Safety Bag for Removal Of Cracked Globes

DAVID B. CLAPP
Engineering Assistant
Public Service Electric and Gas Co.
Newark, N. J.

STREET LUMINAIRE GLOBES are being removed by aid of a safety bag to avoid the hazard of dropping the unit or its broken pieces. The bag as shown in the illustration was a "suggestion" development and is being used by lighting maintenance men of Public Service Electric and Gas Co.

The safety device is made of canvas, has a "normal" opening 60 in. in circumference and is 26 in. deep. The draw cord at top has a short piece of metal as a self-locking catch.

When servicing a luminaire, the maintenance man proceeds up the ladder with the bag and a new globe; the latter is placed temporarily on one of two projections of the side of the ladder. The bag is placed around the cracked globe just above the screw fastenings; then the draw cord is pulled tight and locked by the metal catch. During this operation the zipper slide is at the top to keep the bag closed at the sides. All the cracked and broken pieces of glass are protected from falling.



SAFETY BAG made of canvas is fastened over cracked street light globes before removal from fixture and catches broken glass. Zipper permits access to holding screws when bag is in place

For removal of the cracked globe, the zipper slide is pulled down until there is enough hand room to unfasten the globe attachment. After the globe or its pieces are loose, the zipper is drawn to the top again to close the side and the draw cords are pulled to close the top of the bag. The maintenance man can attach the bag to his belt to carry it down, and then attach the new globe.

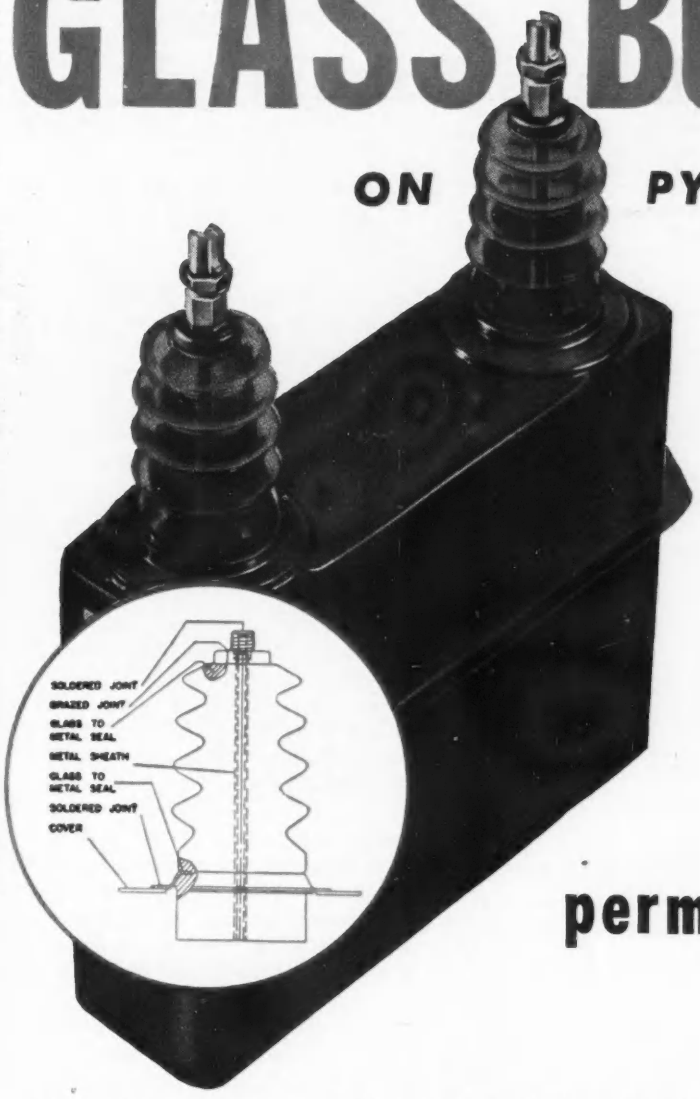
Soap and Ammonia Meter Cleaning Solution

A SOLUTION of 4 oz. of tincture of green soap and 4 oz. of Stronger ammonia added to 1 gal. of water has been found by R. E. Douglass, Pacific Gas and Electric Co., Fresno, Calif., to be effective in cleaning brass and plated steel on meter registers and clock movements. The solution has been in use for some time and has been the means of salvaging many registers which were badly corroded or smoked.

The company's Bureau of Tests reports that the solution is effective in cleaning meter registers but must be used with care, as it will attack the painted dial. Following the cleaning operation an immediate rinse in running water is recommended.

GLASS BUSHINGS

ON PYRANOL CAPACITORS



combine high mechanical strength with a permanent hermetic seal

Here is the most important advance in the design of outdoor power-factor-improvement capacitors since the introduction of *Pyranol in 1931.

In the new bushing, the metal mounting flange is fused directly to the glass, and this flange is welded and soldered to the capacitor case, forming a mechanically strong hermetic seal that is *permanently* moisture-tight. Exact control of glass making materials and precision annealing methods, along with co-ordinated thermal characteristics of the glass and metal, guarantee superior characteristics. These quality controls coupled with seven years of field testing on General Electric capacitors, assure you of the most dependable outdoor capacitor that has ever been offered.

JOHNNY CAPACITOR SAYS: *"Utility management has no quicker means of gaining sorely needed capacity than that provided by *Pyranol capacitors—at the surprisingly low installed cost of $10 per kvar, or less. You can order them today and have them installed in a matter of weeks, when it takes years to obtain generation, transmission and distribution equipment."*

Class ID capacitors with glass bushings are now available in 15 kvar, single phase, 60-cycle ratings for voltages of 2400, 4160, 4800, 7200 and 7960.

**Trade-mark Reg. U.S. Pat. Off.*

GENERAL ELECTRIC

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Another First

1930—G.E. introduced thin kraft paper
1930—G.E. introduced 10 kvar, oil-filled, individual unit
1931—G.E. introduced *Pyranol
1932—G.E. introduced 15 kvar Pyranol individual unit
1937—G.E. introduced resistance-welded, drawn-steel cases
AND NOW—G.E. introduces glass bushings

Crossarm Loading Limits Tabulated

Maximum Permissible Line Angles, in Degrees Based on Crossarm and Pin Strength

Conductor Size and Kind	Pole Top Pin		3¼" x 4¼" Crossarm										3¾" x 4¾" Crossarm					
			Single Arm—No. of Conductors					Double Arm—No. of Conductors					Single Arm—No. of Cond.			Double Arm—No. of Cond.		
	Single	Double	2	3	4	5	6	2	3	4	5	6	2	3	4	2	3	4
6 Bare	53	60	53	39	27	20	15	60	60	55	39	31	53	36	25	60	60	49
4 Bare	31	60	31	24	17	12	9	60	48	33	25	19	31	22	15	60	44	31
2 Bare	21	42	21	15	11	8	6	42	31	21	16	12	21	14	10	42	28	19
1/0 Bare	13	26	13	10	7	5	4	26	20	14	10	7	13	9	6	26	18	12
2/0 Bare	10	21	10	8	5	4	3	21	16	11	8	6	10	7	5	21	14	10
4/0 Bare	7	13	7	5	3	2	2	13	10	7	5	4	7	5	3	13	9	6
6 WP	50	60	50	38	26	19	14	60	60	51	37	28	50	34	23	60	60	47
4 WP	32	60	32	25	17	12	9	60	49	34	25	18	32	23	15	60	45	31
2 WP	20	41	20	15	11	8	6	41	31	21	15	11	20	14	10	41	28	19
1/0 WP	13	27	13	10	7	5	4	27	20	14	10	7	13	9	6	27	18	12
2/0 WP (1)	13	25	13	9	6	5	4	25	19	12	10	7	13	9	6	25	18	12
4/0 WP(1)	12	25	12	9	6	5	3	24	19	12	9	7	12	9	6	25	17	12
500 Mcm WP(1)	12	23	12	9	6	(2)	(2)	23	18	12	(2)	(2)	12	8	6	23	16	11

(1) Conductor tensions for No. 2/0 WP, No. 4/0 WP and 500 Mcm under heavy loading conditions have been limited to 2,000 lb.

(2) Inadequate vertical strength for the number of 500 Mcm conductors shown.

H. F. OSTMAN
System Standards Engineer
Union Electric Co. of Missouri
St. Louis, Mo.

THE ACCOMPANYING tabulation of maximum line angles for various numbers and sizes of conductors is an initial effort to provide an orderly loading of crossarms and pins for 5-kv. and lower range of circuits, based on a study of mechanical strengths. The basic stress data used is that presented in the Wood Handbook issued by the Forest Products Laboratory, U. S. Department of Agriculture.

The Laboratory has demonstrated that a load continuously applied over a period of time to a clear wood member will cause failure if it is ⅝ of the test or short-time load. For our purpose, conductor tensions at 60 deg. F. have been used as the "Continuous" or long-time loads while tensions resulting from "Heavy Loading" conditions have been termed "Intermittent" as they line between the "Continuous" and short-time or "Test" loads. In addition to the factor of ⅝ for long-continued stress, a factor of ¾ for variability in the wood and a safety factor of ⅗ is applied by the Laboratory to the ultimate fiber stress for the species and kind of stress under consideration.

The average bearing value on wood can be expressed in terms of the ratio of the length of bolt to its diameter (L/D) in the main members of the joint. That is, the average unit stress at the proportional limit, on the projected area of the bolt on the wood was about the same for a ½-in. bolt in 3 in. of wood as for a 1-in. bolt in 6 in. of wood.

The basic stress varies considerably for a given species of timber, depending on how the load is applied to the wood fibers. For example, in Western Red Cedar the value for loadings applied parallel with the grain is 1,000 psi., compared to 200 psi. perpendicular to the grain. In Douglas Fir (Coast Region) these values are 1,300 psi. and 275 psi., respectively.

Therefore in fastening a 3¼ by 4¼-in. Douglas Fir crossarm to a Western Red Cedar pole with a ⅝-in. through-bolt (in such a manner that the arm splits the line angle), the conductor tensions are transmitted from the arm to the bolt, first in a plane parallel to the wood fibers in the arm (crushing strength high), and secondly from the bolt to the pole in a plane perpendicular with the pole grain (crushing strength low). Although the area of bolt bearing in the pole is considerably greater than in the arm, a higher stress concentration occurs in the pole fibers under the bolt near the pole surface than in the center of the pole, a situation allowed for in the Forest Products outline for calculating timber joints.

For a single 3¼ by 4¼-in. Douglas Fir arm, a value of approximately 800 lb. resulted as the safe "Continuous" load for the arm, compared to about 400 lb. for a Western Red Cedar pole, a value that therefore becomes controlling since continuous loads in excess of this value will cause crushing of the wood fibers and bending of the bolt. For double arms these values were doubled.

For "Intermittent" loads the above values were tripled. This is a matter of engineering judgment since the "Intermittent" load is not directly comparable to the "Test" load.

The loadings per pin are limited to 170 lb. for "Continuous" loads and 500 lb. per pin for "Intermittent" loads. These values were arrived at largely by tests supplemented by calculation.

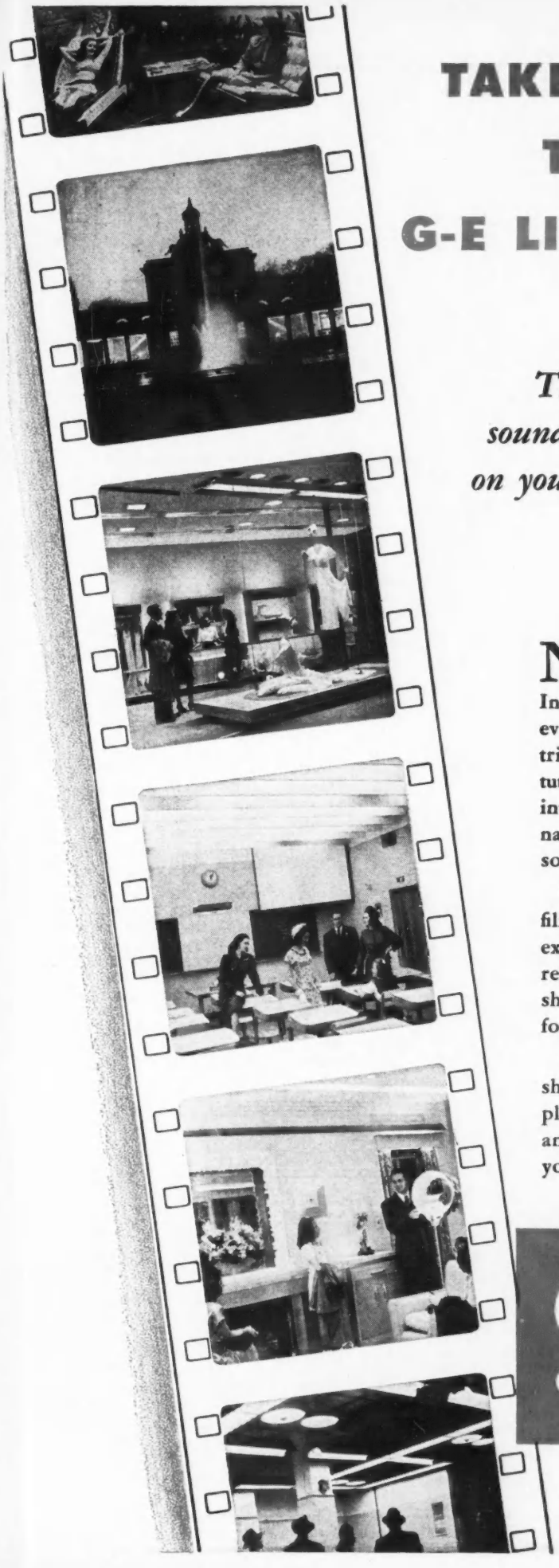
These calculations, checked by tests, are summarized in the table. The conclusions from these studies are:

(1) Generally speaking, insulator pin strength is the limiting factor up to two conductors per arm.

(2) For more than two conductors per arm connection at the pole becomes critical. Therefore the practice of splitting the line angle with the arm and deadending the conductors on the crossarms does not in itself increase the permissible line angle where more than two conductors are involved.

(3) In the arm connection at the pole the wood in the pole is critical since the load transmitted to the pole by the throughbolt is applied perpendicular to the pole grain, while the arm transmits its load to the bolt in a plane parallel to its grain.

(4) The tendency of a pole to split under this type of loading is recognized but no satisfactory method was developed that allowed determination of a pole's resistance to this type of failure. However, the loadings set up, based on crushing of the pole fibers under the through-bolt, gave results that we believe allow pole splitting to be eliminated as a critical factor.



TAKE A PICTURE TRIP THROUGH THE G-E LIGHTING INSTITUTE

with **ARTHUR GODFREY**

This colorful new sound slide film belongs on your Planned Lighting Program

NO one's lighting education is complete without a tour of General Electric's famous Lighting Institute at Nela Park. But since it isn't possible for everyone who's concerned with lighting to make the trip to Cleveland personally, we're sending the Institute all over the country in the form of a thoroughly interesting 30-minute sound slide film presentation, narrated by Arthur Godfrey, the popular radio personality.

With over 70 views in full color, this unusual 35 mm. film highlights the many interesting and educational exhibits which have won G-E's Institute a worldwide reputation as America's "University of Light." It shows the latest developments in Planned Lighting for stores, schools, homes, offices and industrial plants.

The slide film and record are available to you for showings to your own lighting and power sales people, as well as to merchants, architects, contractors and other interested groups. Make arrangements with your nearby G-E Lamp district office.

G-E LAMPS

GENERAL ELECTRIC

Rural Line Construction . . . II

Concluding an outline of materials and type of construction to be used for rural lines; an adaptation from standards of New England Power System. Pole classes, lengths and settings were presented in a previous article*

Guying. Rural lines having Class 6 or smaller poles shall be storm-guyed at approximately 0.5-mile intervals. In lieu of storm guys the next higher class of pole would serve same function, at less cost in many cases.

Guys shall also be used against service drops unless two services balance each other at the pole.

All angle poles shall be guyed in accordance with standard practice. The use of tree guys is recommended when suitable trees are at hand and the guys can be attached near their base.

Table IV shows total horizontal pull (in lb.) in line angle for two wires.

To determine load in guy strand, multiply the horizontal pull, from Table IV, by the factor given in Table V for the particular ratio of L/H.

Choose a guy strand having an allowable load equal to or greater than the calculated load. See Table VI.

Pins and Insulators. Standard porcelain pin-type insulators and 1-in. metal pins shall be used. Dead ends shall be made with spool clevises.

Conductors: Primary — Secondary. In general bare No. 6 Amerductor or No. 6A Copperweld-copper conductors shall be used. Amerductor shall not be used on railroad crossing spans or other locations exposed to smoke or other corrosive atmospheres. In these locations Copperweld conductors shall be used, except that when span lengths are suitable MHD may be used.

Sags are given in Table VII.

Transformers and Secondaries. Transformers shall be installed in accordance with applicable standards.

In general, secondary runs will not be required on rural lines, as each customer or pair of customers will usually be served directly from individual transformers. Vertical racks or crossarms may be used for service drops and for secondary runs when required.

Service drops exceeding 100 ft. in length shall be supported at the customer's end on 25-ft. poles of the smallest class available.

* Electrical World, June 21, 1947, page 78.

TABLE IV—Total Horizontal Pull (lb.) in Line Angle for Two Wires

(Based on Amerductor No. 6 under heavy loading of 0.5in. ice, 8-lb. wind, 0 deg. F. temperature, conductor tension 60 percent of ultimate. Horizontal pull on Copperweld would be somewhat less, hence some Copperweld line angles will be slightly over-guyed.)

Angle Deg.	Average Span Length, ft.									
	200	250	300	350	400	450	500	550	600	650
2	439	528	617	705	794	879	962	1045	1128	1212
4	545	641	735	828	921	1009	1092	1175	1258	1342
6	651	753	853	952	1049	1138	1221	1304	1387	1471
8	757	865	971	1074	1177	1268	1351	1434	1517	1601
10	863	977	1088	1197	1304	1397	1480	1563	1646	1730
12	969	1089	1206	1320	1431	1527	1610	1693	1776	1860
14	1074	1201	1323	1442	1558	1656	1739	1822	1905	1989
16	1179	1312	1440	1565	1685	1764	1867	1950	2033	2117
18	1284	1423	1556	1686	1811	1913	1996	2079	2162	2246
20	1389	1534	1673	1808	1937	2041	2124	2207	2290	2374
22	1493	1645	1789	1929	2063	2169	2252	2335	2418	2502
24	1597	1755	1904	2050	2188	2296	2379	2462	2545	2629
26	1701	1865	2020	2170	2313	2423	2506	2589	2672	2756
28	1804	1974	2134	2290	2437	2549	2632	2715	2798	2882
30	1907	2083	2249	2409	2561	2675	2758	2841	2924	3008
32	2009	2191	2362	2528	2684	2800	2883	2966	3049	3133
34	2111	2299	2475	2646	2806	2924	3007	3090	3173	3257
36	2212	2406	2688	2764	2926	3048	3131	3214	3297	3381
38	2312	2513	2700	2881	3049	3171	3254	3337	3420	3504
40	2413	2619	2811	2997	3170	3294	3377	3460	3543	3627
42	2512	2724	2922	3112	3289	3415	3498	3581	3664	3748
44	2611	2626	3031	3227	3408	3536	3619	3702	3785	3869
46	2709	2932	3140	3341	3526	3656	3739	3822	3905	3989
48	2806	3035	3249	3454	3643	3775	3858	3941	4024	4108
50	2903	3138	3356	3566	3760	3893	3976	4059	4142	4226
52	2998	3239	3462	3677	3875	4011	4094	4177	4260	4344
54	3093	3340	3568	3787	3989	4127	4210	4293	4376	4460
56	3187	3439	3673	3896	4103	4242	4325	4408	4491	4575
58	3281	3538	3776	4005	4215	4356	4439	4522	4605	4689
60	3373	3636	3879	4112	4326	4469	4552	4635	4718	4802

Note: For 3-phase 4-wire, multiply pounds—pull figures by 2.
For spans greater than 650 ft., add 83 lb. to 650-ft. span pounds-pull for each 50 ft. excess.
Total Horizontal Pull = Angle Pull Plus Wind on Wires.

TABLE V—Factor for Ratio L/H

L/H	1/4	1/3	1/2	2/3	3/4	1	5/4	3/2
Factor	4.15	3.24	2.21	1.84	1.66	1.41	1.29	1.19

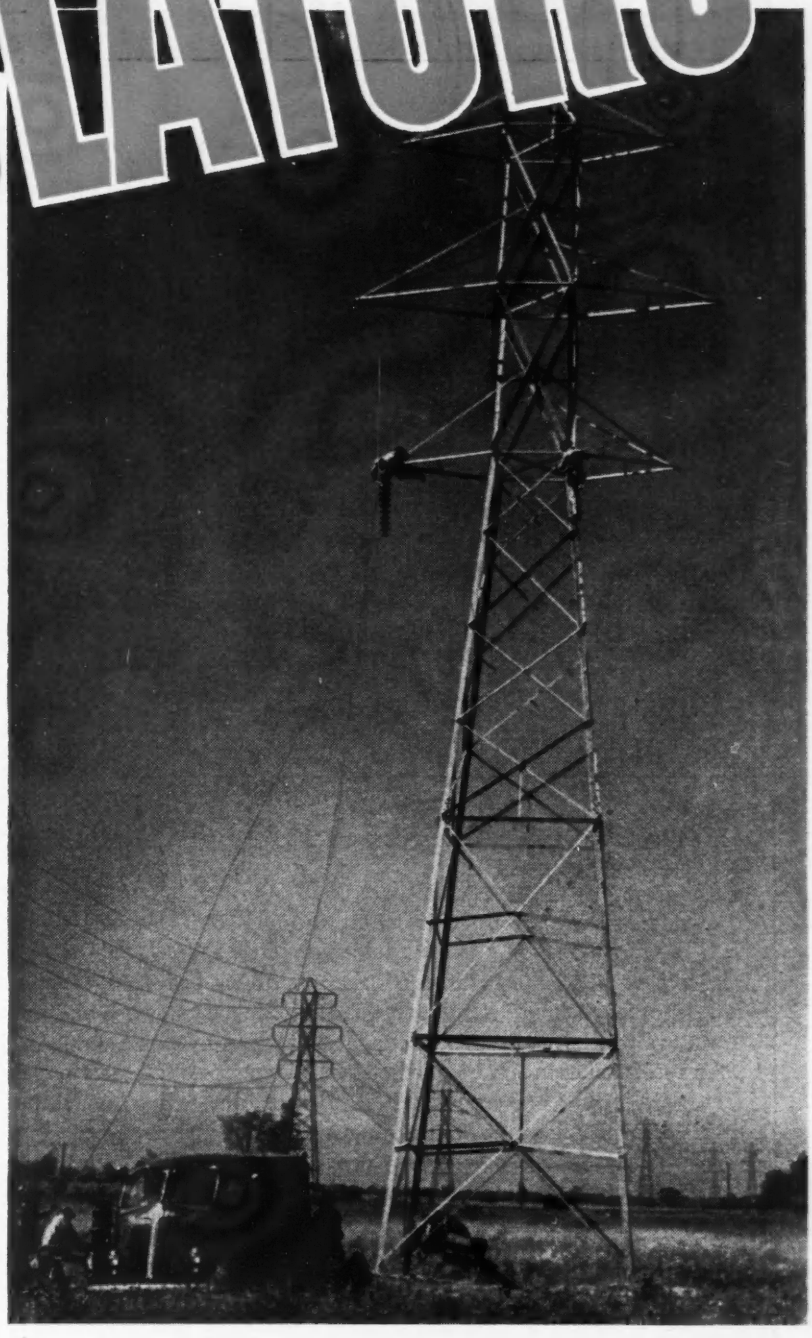
TABLE VII—Sags

Stringing Sags, inches						Span, ft.	Final 60-Deg. Sags, inches	
Amerductor No. 6			Copperweld No. 6A					
30 deg.	60 deg.	90 deg.	30 deg.	60 deg.	90 deg.		Amerductor No. 6	Copperweld No. 6A
6	6½	7¼	6	6¾	7¾	200	9½	9½
10	10¾	12	9	9	12	250	15½	15½
14	15½	16¾	13½	15	17	300	26½	27½
19¼	20½	22¼	21	23	26	350	39½	48
24	26	28¾	37¼	43	50¼	400	58¾	84
34	37¼	42	69½	81	92½	450	89	127
51½	58¾	67¼	117½	127½	138½	500	130	175½
84	96	104½	171½	183	193	550	175	228
134½	146½	158½	235	244	253	600	223	288

TABLE VI—Standard Guy Strand

Allowable Load, lb.	Description
1,100	3 strand No. 11
3,100	3/8 in.—7 strand
7,100	5/8 in.—7 strand
11,100	7/16 in.—7 strand

POWER CUSTOMERS INSULATORS



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. . . . has pointed to the continued preference for O-B on this, and other new construction in progress, to better serve the needs of over a million power customers.

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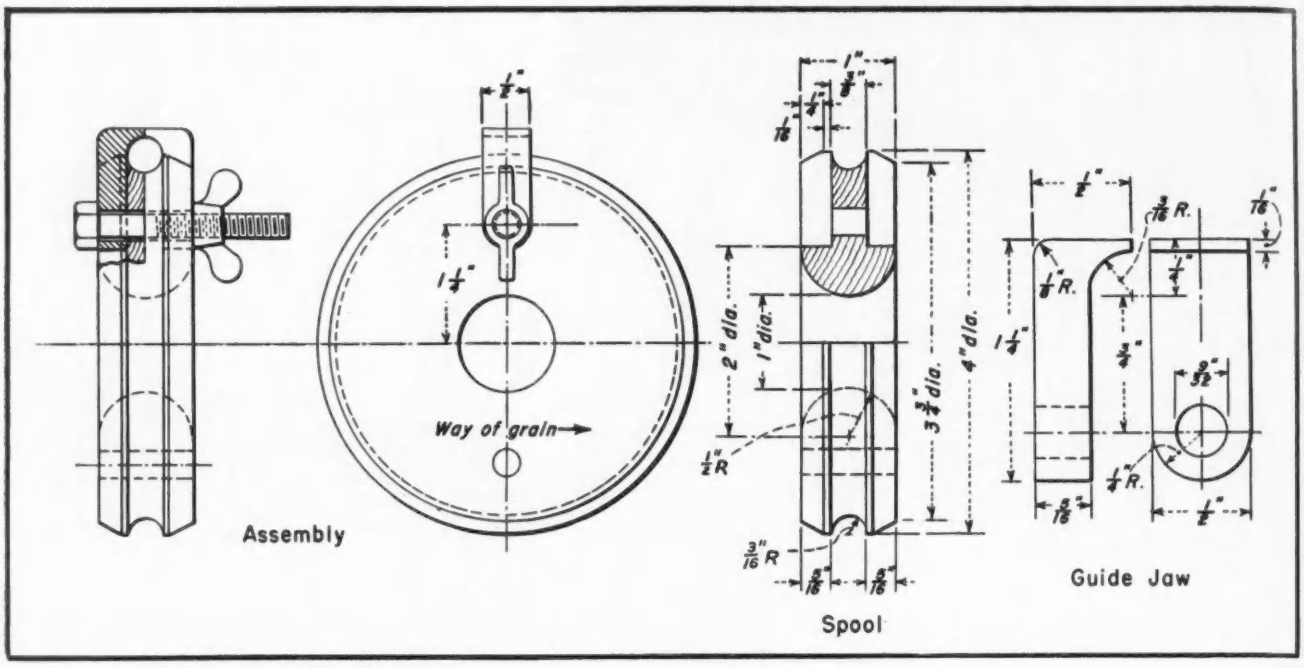
HEADQUARTERS FOR PORCELAIN INSULATION



DETAILS of tube bender, spool and guide jaw

Tube Bender Meets Short Radius Needs

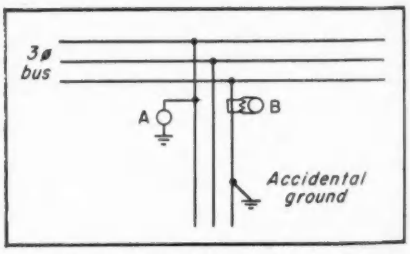
IN INSTALLING oil-filled cable the Boston Edison Co. found it necessary to bend ⅜-in. outside diameter tubing without flattening or otherwise deforming the tube. The device illustrated enables this to be done easily by one man, working to 2-in. radius bends. It consists of a grooved maple disk fitted with a holding clamp, and in using it the tubing is held under the split clamp and bent as desired around the grooved circumference of the disk. The ¼-20x2-in. machine bolt is brazed to a mild steel guide jaw. The spool is of clear, straight-grained maple, impregnated with linseed oil by immersion for 24 hr. Bolt end is peened after the ¼-20 wing nut is in place.

• • •

One Way To Overcome Unclean Outside Air

IN AN EASTERN utility steam plant, a 12,500-kw. turbine generator was designed to draw cooling air from outdoors and discharge it directly into the turbine room. Due to extremely dirty air in the vicinity of the plant, severe contamination of the windings occurred, resulting in lowering the insulation resistance. It became necessary to return the armature to the manufacturer for cleaning and overhauling. Six years later the insulation again reached the danger point, requiring another factory cleaning and reinsulation. To eliminate this expense it was decided to provide a closed cooling system for the generator.

The design of the new layout provides a plate duct fitted to the air discharge and extending overhead and through the building wall to connect with the existing intake duct. A cooling coil is provided for the plate duct, two 49-in. propeller fans being required for installation on the concrete base of the existing intake duct to overcome the resistance of the cooling coil. The air circulation required through the machine is 45,000 cfm. With an assumed cooling water temperature of 80 F. the generator air temperature is to be reduced from 150 F. to 100 F. The cooling coil specified is of the fin-tube type, with an area of 3,760 sq.ft., aluminum brass tubes, cast-iron water boxes and Muntz metal tube sheets. A 750-gpm. motor-driven pump is required to circulate the water through the coils and return it through the discharge tunnel of the plant.



PHANTOM LOAD (at "A") and clip-on ammeter (at "B") as used to locate grounded service

Use Phantom Load To Spot Grounds

P. H. YODER

Electric Distribution Dept.
New Orleans Public Service
New Orleans, La.

ACCIDENTAL GROUNDS which may occur on three-phase branches or services are located by means of a phantom load which draws about 3 to 5 amp. at 230 volts in the arrangement illustrated. The grounded phase is first located with a voltmeter, and

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FLEXIBILITY — secondary power source immediately adjacent to machinery, ready to plug in; permits rearrangement of machines with minimum production loss.

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Four-Channel Strength — each member, sides, top and bottom is a rigid channel; rugged bus bar insulators mounted on 12" centers for greater electrical safety and mechanical strength • **Insulated Plug-In Openings** provide complete safety in applying or removing plug-ins • **Easy Installation** by means of adjustable hangers • **Silver-Plated** contacts at bolted connections.

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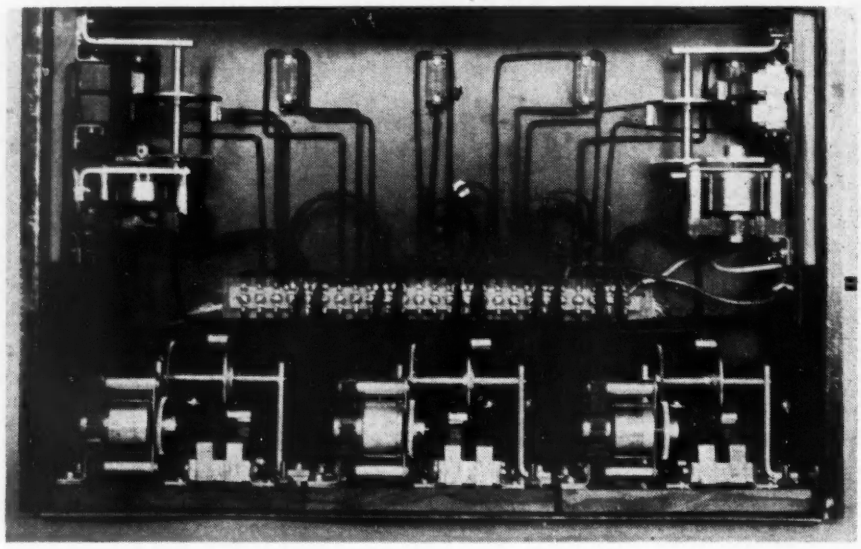
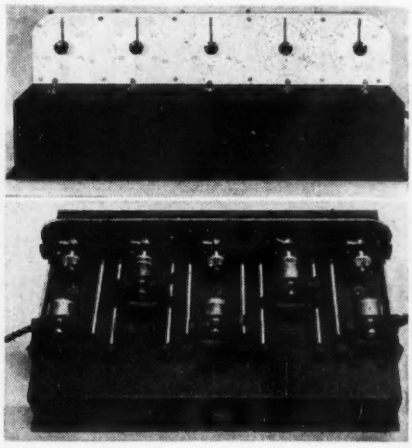
a clip-on ammeter is connected on this leg. The phantom load is then applied between ground and one of the other phases. If the grounded phase is on the particular branch under test, the ammeter fluctuates by the amount of current drawn by the phantom load. If this service is not grounded, no indication will appear on the ammeter. Other services are then checked in the same manner until the ground is located.

• • •





TORQUE TESTING is provided by this Warren motor reduction unit. Front, rear and bottom views are shown

Torque Checker for Warren Motors

E. J. NORTON
Meter Department
The Detroit Edison Co.
Detroit, Mich.

MANY Warren motors which are removed from demand meters and other devices can be reconditioned for future use if a satisfactory maintenance program is set up. After motors are thoroughly cleaned and re-oiled, a careful check has to be made to be sure that the motors have sufficient torque and are operating satisfactorily. To make this test quickly and accurately, a torque testing device was designed and built in the meter department shop testing and repair division of The Detroit Edison Co.

The device is made up of two parts, a timing mechanism for accurately energizing test circuits for 40 seconds, test units for applying known loads to rotors under test and means for indicating operation of rotors under load. When rotors are in place and the control switch turned on, the timing mechanism applies line voltage to the test unit for 40 seconds, during which time the rotor must carry a load increasing up to 2¾ in.-oz. without losing time. Any errors are indicated by the position of the pointers on the test dials.

This testing device has increased the output to about three times the former rate.

• • •

Watt and Var Basis for Accounting . . . I*

E. C. GOODALE
Bonneville Power Administration
Portland, Ore.

USE of watts and vars instead of watts at a specified power factor can greatly simplify power system accounting and also forms a natural basis for billing. Interconnections between systems, in which active energy may flow in one direction and lagging reactive energy in the opposite direction at the same time, makes the ordinary conception of "load at a given power factor" very confusing. As a result the power factor method of accounting makes an engineering problem of what should be simple bookkeeping.

In interconnections, power factor meters might well give way to varmeters. If the wattmeters and varmeters are scaled so that incoming (—) watts and vars push the pointer to the left and outgoing (+) watts and vars push the pointer to the right it will be found that a complete tally of "In" and "Out" quantities may readily be made. The total of the "Ins" (—) will be equal to the total of the "Outs" (+). An example of this kind is shown in Fig. 1. The "In" and "Out" tally is 265 megawatts and 130 megavars each, entering and leaving the bus. The rotation of watthour and varhour meters may be similarly marked and registrations accounted.

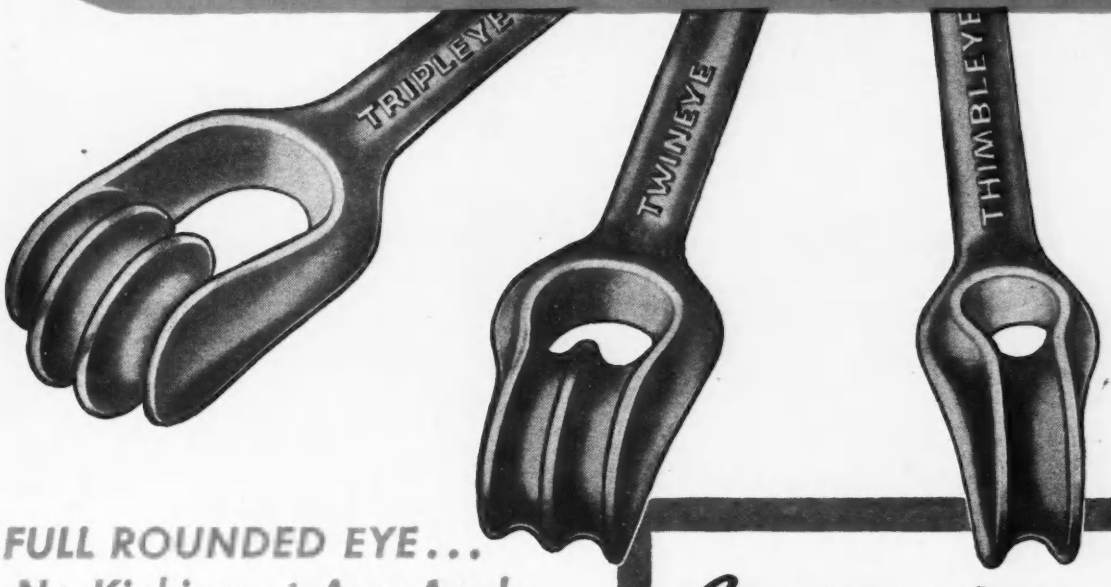
Power and reactive flow from one point to another on an a.c. system is accompanied by changes in the amount and phase of the voltage at the receiving end. These changes are the result of four conditions:

1. Watts flowing through resistance ("WR").

* Beginning a series of three articles on the use of watts and vars to simplify power system problems.

CHANCE Improved THIMBLEYE

Gives GREATER Protection to Guy Strand



FULL ROUNDED EYE...
No Kinking at Any Angle
GROOVED to Fit Guy Strand

Chance Thimbleye Anchor Rods, and Guying Fixtures, the FIRST choice of users for many years, have recently been improved by Chance engineers. The redesigned eye forms a perfectly shaped "Thimble" and the sidewalls and groove of the eye extend around the head of the rod. This keeps the strand from flattening under tension, preserves its cylindrical shape and *prevents it from kinking* at any one point. The sidewalls of the groove are formed to fit snugly around the guy strand, preventing it from flattening under tension.

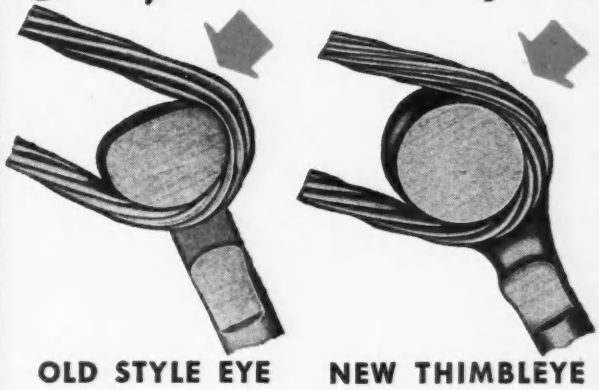
You will instantly see that the newly designed eye gives greater protection to guy strands than the old style eye.

The Improved Thimbleye is available in threaded rods, Never-Creep rods, and the complete line of guy fixtures.

For greater line security, specify Chance Thimbleye Anchor Rods and get this additional protection. Order through your regular source of supply.

Chance Thimbleyes are manufactured and distributed by the A. B. Chance Company and the following manufacturers: Joslyn Mfg. & Supply Co., Chicago, Illinois, Line Material Co., Milwaukee, Wisconsin, Oliver Iron & Steel Corp., Pittsburgh, Pennsylvania, Kortick Mfg. Co., San Francisco, California, Seyler Mfg. Co., Pittsburgh, Pennsylvania, Locke Insulator Corporation, Baltimore, Maryland, N. Slater Company, Ltd., Hamilton, Ontario.

Compare these eyes!



OLD STYLE EYE

Notice the strain placed on guy strand when used at angle with old style eye.

NEW THIMBLEYE

The new Chance Thimbleye *protects* the guy strand from strain at any angle.

Diagram at left shows how the guy strand is supported and protected by the snug-fitting sidewalls of the groove, which extend all the way around the head of the rod.

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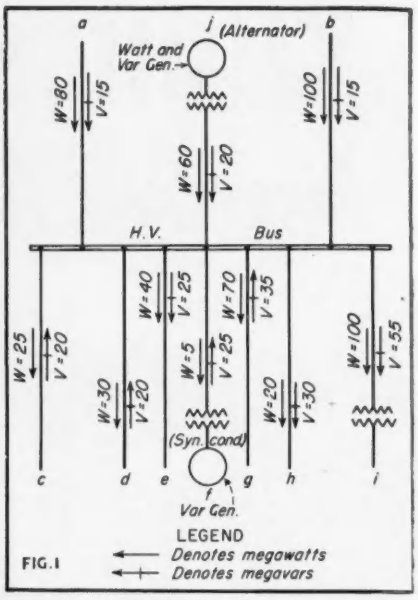

FIG. 1

BUS to which are connected a number of circuits including a generator and synchronous condenser. The "in" and "out" tally of megawatts would be 265 "in" and 265 "out", and megavars "in" 130, "out" 130

2. Vars flowing through inductive reactance ("VX").

3. Vars flowing through resistance ("VR").

4. Watts flowing through inductive reactance ("WX").

The first two conditions tend to decrease the voltage at the receiving end. The third condition tends to make the receiving end voltage lead the sending. The fourth tends to make it lag. If the reactance is capacitive instead of inductive, the effect is opposite to the above in cases 2 and 4.

Just as the flow of vars through inductive reactance causes a decrease in voltage (as in condition 2, above), an increase in voltage between any two points on the system tends to send vars from the higher to the lower voltage point. This assumes that the impedance between the two points is mainly inductive, as is usually the case on large and particularly on high-voltage systems.

Unequal transformer taps on interconnected systems cause increased var consumption and watt losses within the loop formed by the interconnecting conductors and the transformer windings having the unequal taps. The increase in var consumption is taken care of by the var-generator or watt-and-var generator supplying the transformer that has the higher induced secondary voltage. At the same time the transformer having the lower in-

Now! LIFE INSURANCE EXPERTS PROVE THAT FORD TRUCKS LAST *up to* 19.6% LONGER

FOR THE first time in history, the scientific methods used by life insurance companies in computing rates have been put to work in figuring out life-expectancy tables for Ford Trucks.

4,967,000 Trucks Studied . . .

Wolfe, Corcoran and Linder, leading New York life insurance actuaries, assembled the records of all trucks of the five sales leaders registered from 1933 through 1941 . . . 4,967,000 trucks in all. Then they prepared *truck* life-expectancy tables in exactly the same way that they prepare *human* life-expectancy tables for life insurance companies.

Ford Trucks On Top!

The result? Ford Trucks Last Longer! Up to 19.6% longer than the other 4 sales leaders! Why is this true? Because Ford Trucks are *built* stronger. They're *built* to last longer! That extra life that's put into Ford Trucks comes from Ford experience in building *more* trucks than any other manufacturer. Ford knows *how* to build trucks that last longer!

See your Ford Dealer today. See the life-expectancy charts. You'll see why it'll pay you to place your order for a Ford . . . the truck that lasts longer!

Certified Proof

What Longer Truck Life Means to You . . .

Why It Pays to Wait for a New Ford Truck!

It stands to reason the longer you use a truck, the less it costs to own. That's why longer-lived Ford Trucks are the top truck value. And, logically, Ford longevity means lower maintenance costs . . . less time in the shop. It means more unused miles when you're ready to trade, and a better trade-in. Yes, any way you look at it, you'll get more truck for your money with a Ford Truck . . . because Ford Trucks last longer!

FORD TRUCKS LAST LONGER!

The life expectancy of a Ford Truck is:

13.1% longer than that of Truck "B"
3.2% longer than that of Truck "C"
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OFFICIAL ACTUARIAL CERTIFICATE

Based on the application of sound and accepted actuarial methods to the actual experience as measured by truck registrations, we hereby certify that, in our opinion, the accompanying table fairly presents the relative life-expectancy of the trucks involved.

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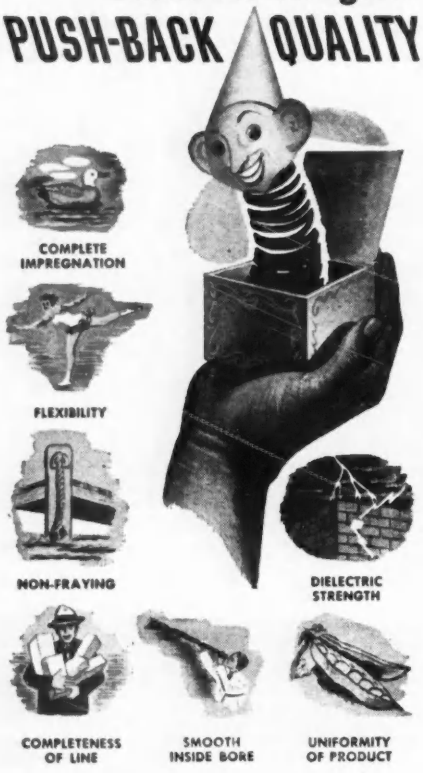
Life Insurance Actuaries, New York, N. Y.

6th among the superior features of DIEFLEX

VARNISHED TUBING PRODUCTS...is good PUSH-BACK QUALITY



An important factor in the production of electrical devices is ease of assembly. Dieflex varnished tubings and saturated sleevings are an aid in assembly because they have unusually good push-back characteristics. It's easy to solder and splice when Dieflex is used.

Dieflex varnished tubing products are made with specially formulated oleoresinous baking-type varnish. Both cotton and glass fiber types are available.

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ELECTRICAL INSULATION

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REPRESENTATIVES in: DETROIT 2, 11341 Woodward Ave., MINNEAPOLIS 3, 1208 Harmon Pl., and PEORIA 5, 101 Heinz Court.

ducted secondary voltage has its output voltage raised by the var transfer, a portion or all of the var load in effect having been shifted from this transformer to the one with the higher induced secondary voltage. The quantities of vars that would actually be transferred in a given case depends on the capacities of the var-generators and characteristics of the lines to and between the transformers and on the values of their taps and impedances.

Var Generators

A var-generator is a source of vars just as a watt-generator is a source of watts. Transmission lines and cables; static and synchronous condensers and alternators, all are forms of var-generators.

Transmission lines are var-generators due to the shunt capacitance between conductors and between conductors and ground. The vars thus generated on the line are gradually absorbed by the line, in reactance voltage drop, as the load passing over the line is increased. With no load over the line nearly all of the vars generated on the line are available for use on the system to which the line is connected. A transformer similarly absorbs vars in inductive reactance voltage drop within the transformer in proportion to the product of its percent reactance times its percent load.

High-voltage cables are var-generators which, due to the proximity of the conductors, generate relatively more vars than transmission lines. Very little var energy is absorbed in the cable as the load builds up, since a cable has negligible series inductive reactance.

A synchronous condenser is a var-generator when its field is over-excited. When the excitation is decreased below a certain critical point it becomes a var-load, the lower the excitation the greater the load. Finally, as the field excitation is further decreased, a second critical point is reached when the weak rotor field allows the rotor to fall out of step with the stator's rotating field and the machine acts like an induction motor, at such time taking a relatively large amount of var energy from the system.

Similarly, an alternator on an interconnected system is made to increase its var output by increasing its excitation.

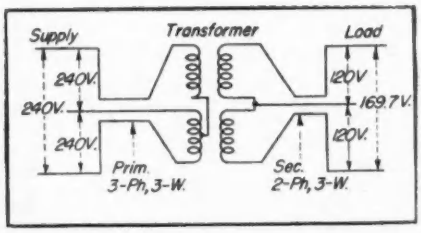
• • •

Transformer for Balancing Load on 3-Phase Supply

LESTER CUMMINS
Commercial Engineer
American Transformer Co.
Newark, N. J.

IN EXISTING 3-wire lighting feeders the use of a double-wound, phase-changing transformer can be used to advantage to transform 240-volt, 3-phase power to 120 volts for lighting. The transformer provides a means of balancing the load, on all three phases and at the same time makes it possible to use the existing three-wire, 120-volt lighting circuit without materially revamping the wiring.

The 3-phase side of the transformer is connected directly to the 3-phase, 240-volt power lines and the 120-volt, 2-phase side is connected for 3-wire service. The output is then a 3-wire circuit with 120 volts on each side of the neutral. It is to be noted, however, that 240 volts is not available across the outside lines of the 2-phase, 3-wire circuit since the two 120-volt leg voltages add up vectorially to 169.7 volts. It must also be kept in mind that the 2-phase neutral



SCHEMATIC CONNECTIONS of phase-changing transformer

wire must be of sufficient size to carry 41 percent more current than either outside wire.

In connecting the lighting load to the 2-phase circuits it is important that the load be properly divided so that either side will not have more than half the entire 2-phase transformer rating. The internal and external connections of a standard dual rated double-wound, 3-phase to 2-phase transformer are shown in the diagram.

Using a phase-changing transformer in this manner offers substantial economies to the user as well as operating advantages to the utility and maintenance man.

He gets the FATTEST envelope

YOUR PAYMASTER never sees him . . . he never signs the payroll . . . but Inadequate Wiring, the industrial jinx, draws big money.

Week in and week out, overtaxed, overextended, obsolete wiring can tax plant efficiency 25 to 50 percent without detection until a major tie-up occurs.*

To remove this costly imposter from your payroll, call in your plant power engineer, your consulting engineer, electrical contractor or utility power salesman. These men can find his finger prints anywhere in the plant.

*WIRE AHEAD, a new booklet discussing preventive maintenance . . . the symptoms of inadequate wiring . . . and presenting plans for anticipating electrical demand, is now in preparation. We shall be glad to send it on request as soon as it is available.

ANACONDA
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ANACONDA WIRE AND CABLE COMPANY

DIGESTS

Condensations and abstracts of articles in the foreign press, committee reports, unpublished papers before numerous technical societies, research bulletins, standards

Modern Switchgear Insulation

From an article by R. N. Buttrey in "The Electrician," London, July 26, 1946.

SYNTHETIC MATERIALS developed in war time which are useful for switchgear insulation include thermo-setting plastics and organo-silicones. Some of these are important for molded parts to improve the standard of insulation. Physical properties of some of these are given in the accompanying table, along with better-known materials.

Polyvinyl chloride has good chemical stability with resistance to water, organic acids and alkalis and mineral oils. It is non-inflammable and impervious to the action of ultraviolet light. Its principle value is for low-tension cable insulation and as secondary insulation up to 11 kv.

Polythene, being a pure non-polar hydrocarbon, has low dielectric loss, high volume resistivity and dielectric strength. Its non-tracking characteristics make it suitable for high-tension primary insulation. Being suitable for extrusion injection, it may replace hand or machine wrapping of paper and fabrics followed by impregnation. It is comparatively unaffected by heat below 100 deg. C.

Experience with Automatic Air Soot Blowers

From a paper by H. L. Smith (Buffalo Niagara Electric Corp.) before A.S.M.E., Detroit, June 17-20, 1946.

THREE BOILERS of the Niagara-Hudson system, each with a continuous rating of 900,000 lb. per hr. at 1,320 psi. and 900 deg. F., are equipped with automatic air soot blowers as a means to minimize loss of steam from the closed cycle. The arrangement of soot-blower elements at the Oswego station is a deviation from conventional steam practice primarily to economize on capacity of the air-compressing equipment, but it also facilitates automatic control.

Air taken by some of the individual blowing elements exceeds 10,000 cu.ft. per min. for short periods and averages about 3,000 cu.ft. per min. if all elements are blown successively with no appreciable intervening time. Taking advantage of the maximum allowable time for the cleaning cycle by selecting and grouping individual blower elements and operating one at a time, the compressors can run continuously and build up a pressure of 250 psi. to meet the demand of each succeeding group. Thus minimum compressor size was obtained.

Use of automatic air soot blowers for five years has shown that they keep the boilers unusually clean with no other means such as hand cleaning. The air requirements, fluctuation in storage tank pressure, and total operating time are less than anticipated. Energy for compressed air has been the only daily cost of any consequence, and is equivalent to 1.4 tons of coal per day compared with 7.1 tons for steam blowers. Maintenance costs have been low. Erosion of boiler pressure parts due to injury by air blowers has been slight.

Several significant advantages include (a) boiler make-up averaging 0.3 percent instead of 1.5 percent, with only 20 percent as much total solids entering the steam system as with steam blowing; (b) operation of boilers on automatic control while blowers are in use; (c) removal of human element in operation of blowers.

First cost of the air blowing equipment itself is 20.7 percent more than for steam blowing, but against this there is a saving in amount of make-up equipment and boiler plant, so that the total installation for air blowing costs 14.9 percent less, or a saving of $25,000 per boiler.

Properties of Insulation for Switchgear

Material	Specific Gravity	Strength in Tension psi. (000)	Strength in Compr. psi. (000)	Strength in Inpact ft.-lb. *	Dielec. Strength Volts# per mil	Power Factor, 50 cyc. Percent	Water Absorp. 24 hr. Percent	Softening Point Deg. F.	Specif. Induc. Capac. 50 cyc.	Volume Resistivity, ohms per cm.
Thermo-setting laminates:										
Paper base	1.3–1.4	7–18	20–40	0.3–3.8	400–1000	0.1–2.5	0.3–9.0	.....	3–5	10^{10}–10^{12}
Fabric base	1.3–1.4	8–15	20–44	0.8–7.5	150–600	.....	0.3–9.0	.....	3–5	10^{10}–10^{12}
Wood base	1.3–1.4	to 40	to 30	0.6–0.8	180–600	.....	0.9–6.0	.....	3–5	10^{12}–10^{13}
Ceramics:										
Porcelain	2.3–2.5	6–8	64–78	0.9	280	1.7–2.5	0	.....	6–7	Above 10^{14}
Steatite	2.5–2.6	7–8.5	120–130	1.3–2.3	200	0.3	0–0.1	.....	5.5–6.5	Above 10^{14}
Mycalex	2.95–3.44	5–7	22–30	1.2	340–360	0.2–0.3	0.003–0.03	.....	7–8	10^{13}–10^{15}
Thermo-plastics:										
Polythene	0.92–0.94	1.2–2.4	.....	.....	1,000	0.05	0	239	2.0–2.3	10^{17}
Polystyrene	1.054–1.070	5–9	11.5–15	0.2–0.5	500–700	0.01–0.03	0–0.05	170–175	2.6–2.7	10^{17}–10^{19}
Methyl-methacrylate	1.16–1.26	4–10	10–15	0.2–0.5	500	5–7	0.3–0.5	145–190	2.8	Above 10^{15}
Cellulose acetate	1.14–1.37	2.5–10	5–30	0.9–1.6	350–900	1–6	2.0–6.0	100–215	3.5–6.4	10^{12}
Ethyl cellulose	1.07–1.18	2–9	8–20	.....	400–600	0.5–1.5	1.0–2.0	120–200	2.5–3.7	10^{15}
Polyvinyl chloride	1.35–1.40	3.5–4	.....	.....	250–500	3–15	0.01–0.1	230	4.0	10^{12}–$4x10^{13}$

* For thermo-setting laminates and polystyrene, energy to break ½ x ½-in. bar (Izod); for methyl-methacrylate and cellulose acetate, energy to break ½ x ½-in (Charpy); for ceramics, energy to break ½-in. diam. rods (Charpy).
# For ½ in., except porcelain and steatite 0.2 in.

WIRE?
PLENTY OF IT

You can get ALUMINUM building wire now!

Why not get started on those wiring jobs for homes, stores, and factories. Your electrical supplier has Aluminum Building Wire in stock. Or he can get it for you in a hurry. You will be pleased with the price.

Aluminum Building Wire has been approved by Underwriters' Laboratories, Inc. The utilities companies have used aluminum cables for high-voltage transmission lines for 50 years. More than 1½ million miles of this cable are now in service.

We do not make insulated wire, but will be glad to refer you to manufacturers who do make Aluminum Building Wire. ALUMINUM COMPANY OF AMERICA, 2138 Gulf Building, Pittsburgh 19, Pennsylvania. Sales offices in leading cities.

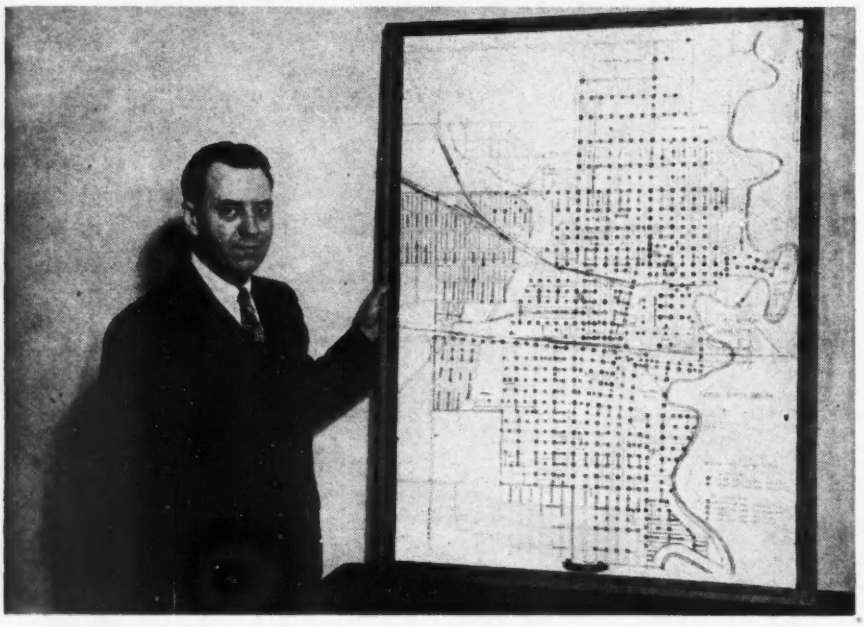
MORE people want MORE aluminum for MORE uses than ever

ALCOA FIRST IN **ALUMINUM**

IN EVERY COMMERCIAL FORM

LOAD BUILDING

Existing and Proposed Street Lighting on One Map



MR. WHEELER and his map

TO SHOW Fargo, N. D., officials street lighting in their city as is and as proposed, G. G. Wheeler, Northern States Power Co., Minneapolis, Minn., brought forth a novel map.

Usually two maps are prepared for such purpose, one of the existing and the other of the proposed system. Wheeler combined the two into one and at the same time made it more interesting because the thing itself is clever.

Through the map, which is of stiff paper board mounted in a frame, holes are punched at each street light location, both existing and proposed. Behind the map is another piece of cardboard in which two sets of holes are punched, one for the existing and the other for the proposed units. A small movement of the back board will bring one set or the other into match with the holes in the map. Thus these holes are blanked off or opened up to show the existing or proposed system. The holes in the backboard are covered with different colored cellophane to indicate different sizes of lighting units.

In use, the map is set up in front of a light box or a window. The light shining through shows the lamp locations and sizes of the system for which the back board is set. By means of a small handle on the front the back board is shifted slightly and the other system comes into view.

• • •

Heating Cable Protects Water Systems

TO PROTECT water pipes from freezing, the rural service department of Central Vermont Public Service Corp., Rutland, has lately prepared notes on the application of soil heating cable to this expanding field. Ralph J. Bugbee, the company's agricultural engineer, states that the cost of this equipment is moderate and its life long, a unit of 60 ft. with thermostat being available for $8 to $12, depending on the type of thermostatic control selected. Additional 60-ft. units up to the current capacity of the thermostat cost about $5. Units are connected in parallel to the supply circuit, using cables in 120-ft. lengths on 220-volt circuits and 60-ft. lengths on 110. The load runs at 3.6 amp. per length, and cables are not allowed to be run through walls or floors without proper protection.

To avoid breaks in the insulation, great care is necessary in removing the outside lead coating, cutting the lead back from the end to leave at least ¾ in. of exposed heater wire and at least 1 in. of full insulation between the wire and the lead cable. Coverage with friction and rubber tape follows, and in some cases a short piece of lead pipe is slipped over the cable joint, or a mould may be used, filling the latter with furnace cement. Sharp bends are avoided. If direct contact with concrete is involved, it is desirable to paint the cable or dip it in varnish or shellac, or a mixture of these. Care must be taken to provide proper heat dissipation at all points. Pipes may be wrapped with the cable, or taping or strapping used, wrapping with asbestos paper or sectional asbestos pipe. Either air or immersion thermostats may be used.

So far, the Code and underwriters have not ruled on proper installations of this conduit in buildings. Experience indicates the desirability of providing a fuse for each installation, rated not to exceed 15 percent of its total connected load. A pilot light helps check operation and in setting and adjusting the thermostat. Extensions through walls and floors are made with regular conductor, according to code. Joints are not permitted

A Philco is **Always at Full Charge**

Many engineering improvements make a Philco Storage Battery more efficient and maintenance-free—make a Philco cost less—give a Philco longer service life. But the feature which sets a Philco entirely apart from all others is the modern Floté element that eliminates low cells in full float service.

To be sure of getting the most efficient, dependable battery service, at lowest cost —specify a modern Philco Floté Battery. Write for specification data.

PHILCO

STORAGE BATTERIES

PHILCO CORPORATION • STORAGE BATTERY DIVISION • TRENTON 7, NEW JERSEY

ANYONE can measure electrical insulation resistance in generators, motors, wiring and other electrical equipment with a "Megger" Insulation Tester . . . quickly . . . easily. Merely make connections, turn the crank and read the position of the pointer on the scale.

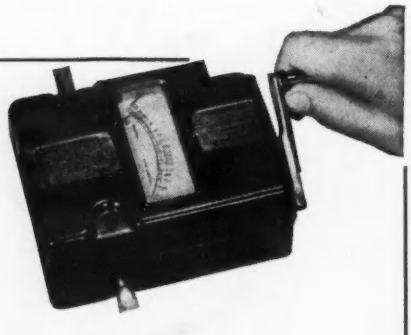
This popular type of "Megger" instrument consists essentially of a direct-reading ohmmeter mounted with a d-c hand generator in a rugged molded plastic case. It is conveniently small . . . can be easily carried by hand. It operates unfailingly, anywhere, anytime . . . without outside power supply or adjustments. And, it provides you with insurance against electrical failures.

Other types of "Megger" Insulation Testers are available in various types with ratings up to 10,000 megohms and 2500 volts d-c. Write for descriptive illustrated Bulletin 1735-W.

*REG. U. S. PAT. OFF.

"MIDGET MEGGER" TESTER

. . . with the same "big" features: used for detecting and diagnosing trouble in nearly all types of electrical equipment. Ratings up to 50 megohms and 500 volts. It's a convenient answer to many of your electrical insulation problems. Write today for Bulletin 1785-W.



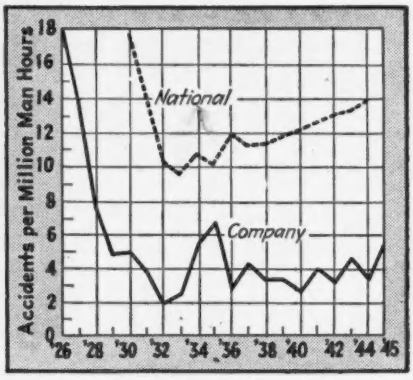
James G. BIDDLE CO.

ELECTRICAL & SCIENTIFIC INSTRUMENTS

1316 ARCH STREET • PHILADELPHIA 7, PENNA.

to come at a low point where condensation can run down and form drip from the joint. In such cases the best practice is to bend the joint upward so that the drip will come at the bend.

•



SAFETY PROGRAMS have been effective in reducing the frequency of accidents per million man-hours to one-fourth the value 20 years ago. The number of fatal accidents has been similarly reduced, from two to five per year down to an average of one in three years since 1932

Safety Program Cements Employee Relations

C. B. BOULET
Personnel Director
Wisconsin Public Service Corp.
Milwaukee, Wis.

A GOOD SAFETY PROGRAM that gets results is a mighty cog in the wheel of employee relations; good relations do not go with a bad accident record. Like a lot of other companies we awoke to the need for a consistent, hard driving safety program the hard way. In 1924, we had five fatal accidents and 124 lost time accidents. We did something about it. In 1945, we had no fatal accidents and 14 lost time accidents. That is still far too high and shows that continued efforts are necessary.

Every one of our 1,500 workers must be a travelling first aid department because our operations are spread over 12,000 sq. mi. of 17 counties. Schooling in the fundamentals of first aid, the prone pressure method, control of arterial bleeding, etc., is combined with training in safe practices for each job and the probable results of doing it any other way.

Placing responsibility on our supervisors is the basis of our safety pro-

gram. Our 125 supervisors have charge of line crews of from two to six men, of divisions of four or five crews, and of plants and other operating departments. Three field men and a director are in the safety department to work with supervisors and crews. The field men have worked as linemen and foremen and have experience that makes for respect for their judgment and advice.

When an accident does occur we find out why. We are careful that we do not fix "blame" for accidents. We don't care whose fault it was. We do want to know "why" a man did a thing in such a way as to cause an accident . . . so we can keep somebody else from getting hurt. Because our men know this and respect our sincerity in their behalf, it is easier for us to find out just how and why accidents happen. This policy has been very helpful in the correction of accident-causing conditions.

Cooperation Essential

Each departmental group holds a safety meeting for one hour each month. These meetings are frequently attended by the safety field men, by Employers Mutual safety engineers and nurses. The latter give talks to the men on their own personal health, tell them how to avoid colds from exposure, and refresh their thinking on first aid problems. The cooperation of the insurance company's engineers brings us the outside point of view and continually reminds our people of the importance of safe thinking.

An important contribution to our safety program is made by other company departments. The engineering department helps us solve technical problems; the operating department works out solutions to safety problems that affect their work; the advertising and publicity department aids in setting up safety contests and preparing the publicity that helps make them effective; the purchasing department cooperates in purchasing safe tools and equipment.

Safety programs must be gaged by results. Our program has saved lives, reduced compensation costs, decreased time lost by accidents, improved employee relations. We feel that this record is made possible by the wholehearted and sincere interest on the part of top management; the placing of responsibility for the pre-

BERMICO*
FIBRE CONDUIT

FOR SUREST CABLE PROTECTION - - - SPECIFY BERMICO CONDUIT

1 **LIGHT.** Easily handled on the job; one man can carry several 8-foot lengths at once—lay more per working hour.

2 **TIGHT.** All joints are precision milled for tight, speedy, installations.

3 **STRONG.** Bermico Conduit is engineered to take the shocks and stresses of transport . . . the heavy loads imposed during installation.

4 **NO SPLIT COUPLINGS.** With Bermico's specially designed couplings, you end the expense—the loss of time required to replace broken couplings.

5 **WATER PROOF.** Bermico's water absorption factor is extremely low—its insulation factor extremely high, even under toughest conditions.

6 **ACID RESISTANT.** Resistant to soil acids and alkalies, Bermico Conduit is, itself, chemically inert.

7 **SMOOTH INSIDE BORE.** Quick and easy cable "pull throughs"—without danger of abrasions—when you're using Bermico *inspected* conduit!

8 **UNIFORM.** Four rigid factory inspections guarantee Bermico's uniformity of dimensions, specifications and quality.

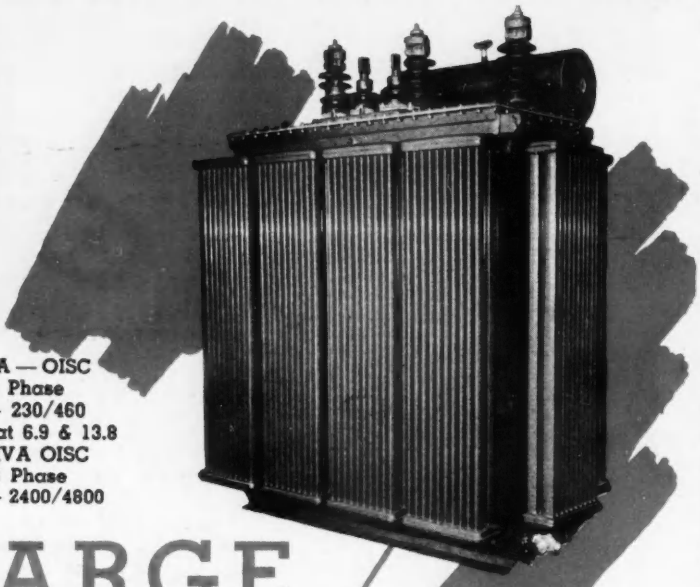
distributed by
WESTINGHOUSE ELECTRIC SUPPLY COMPANY
Offices in all leading cities

*Reg. Trade Mark

BERMICO FIBRE CONDUIT—A PRODUCT OF BROWN COMPANY

POWER AND DISTRIBUTION TRANSFORMERS

DAVIS



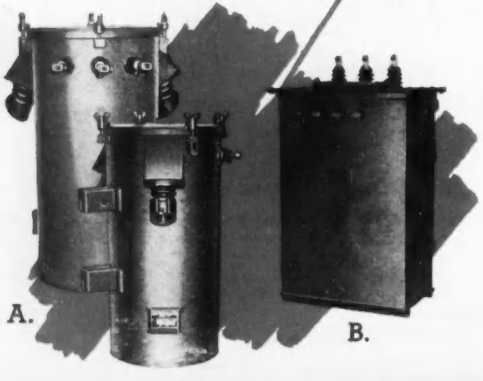
TOP: 1500 KVA — OISC
60 Cycles, 3 Phase
6900/13,800 — 230/460
4 — 2½% Taps at 6.9 & 13.8
RIGHT: 2500 KVA OISC
60 Cycles, 3 Phase
24,000/48,000 — 2400/4800

LARGE

Regardless of the size of the job, every Davis Transformer is engineered and constructed with a sound understanding of the requirements of

UTILITIES or INDUSTRY

and is built to give long, continued and dependable service under the most exacting conditions and with a minimum of upkeep and service.



A. B.

SMALL

A. 15 KVA Single phase
oil cooled
2400/4160Y — 120/240
B. 25 KVA 3 phase
oil cooled
2400/4160Y — 120/208

DAVIS TRANSFORMER

DAVIS TRANSFORMER CO.
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MANUFACTURERS OF OIL COOLED, DRY TYPE, POWER AND DISTRIBUTION TRANSFORMERS

NEMA

vention of accidents on department heads and supervisory employees; the utilization of every possible means to maintain an active interest in safety among workers and supervisors.

•

20,250-Kw. Hydro Installed in 1946

THE MEAGER TOTAL of 5,850 kw. of hydroelectric capacity, reported installed in 1946 in the January 18 (statistical) number of ELECTRICAL WORLD, was not correct. The listing of new installations should have included a 14,400-kw. unit at Pensacola Dam which is owned by the Grand River Dam Authority, an agency of the state of Oklahoma. Thus the total should have been 20,250 kw. for hydro capacity installed.

For the correction we are indebted to W. R. Holway and Associates, consulting engineers for the project. Pensacola Dam was taken over by the federal government in the early days of the war and was returned to the Authority in September, 1946. Thus the Authority was not on the then compiled list of electricity producers from whom the data for the published table were obtained. This is the explanation for the error.

•

Boosts Lighting Of Gas Stations

EFFECTIVE HELP in selling automobile service lighting is to be found in a recent issue of *Shell Progress*, published bi-monthly by the Shell Oil Co. for its employees and dealers. A four-page, well illustrated article, "Light on the Crossroads," tells how good lighting brings in the customers; helps to make the sale; gets the work of the station done faster, better and more safely; and is good advertising.

The dealer is advised to obtain advice and help in his lighting problems from specialists of the Shell company or from local utility representatives and electric lighting equipment suppliers.

The article outlines the numerous ways in which service station lighting can be improved, from cleaning and relamping present fixtures to an overall rebuild.

Made to SELL . . . with CHROMEL*

. . . the Original Nickel-Chromium Heating Element Wire

How'd you go for a grilled cheese sandwich? Done to perfection . . . just the way you like 'em . . . thanks to the durable CHROMEL heating element wire used in modern electric grills. CHROMEL, you know, is the original Nickel-Chromium resistor wire. With its fine durability it lasted over 300 times longer than any other then known material. Thus CHROMEL first made electrical heating really practical. It provides a clean, even, odorless heat that can't be beat for . . . well . . . grilling tasty cheese sandwiches. Try one!

Yes, you'll find durable, desirable CHROMEL resistor wire carrying the heating load in millions of electrical appliances . . . grills, toasters, ranges, roasters . . . and in countless industrial and commercial devices, too. Our Catalog-M1 contains much helpful technical information on the CHROMEL Alloys and their application . . . information of interest to your Load Building Department. Want a reference copy?

Chromel
NICKEL | CHROMIUM WIRE

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HOSKINS MANUFACTURING COMPANY • Detroit 8, Michigan

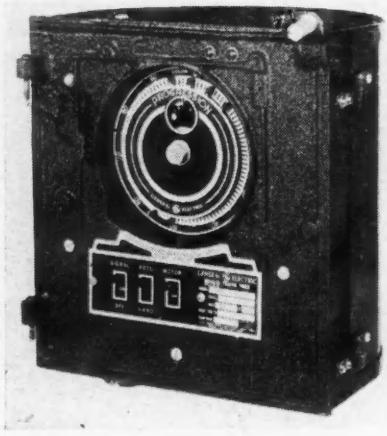
NEW EQUIPMENT

Traffic Signal Controllers Incorporate New Features

A NEW LINE of traffic signal controllers superseding the Type D line and featuring oil impregnated bearings, stainless steel springs and hinged dust covers as well as other construction improvements, has been announced by the lighting division, General Electric Co., Schenectady, N. Y.

A compact plug and socket type connector has been substituted for the jackboard on the bottom of the timer. The new plug provides greater ease in handling as there are no holding screws and no possibility of water, dirt, or oil collecting around any of the contact points, it is reported. All electric contacts are mechanically shielded and give a larger contacting surface with greater electrical creepage distances.

A Type C-5 Telechron motor has been substituted for the Type C-4 used on previous models. The new motor utilizes a higher temperature oil in a sealed gear case, thus reducing the necessity of lubrication. The terminal shaft of the motor is suspended in two



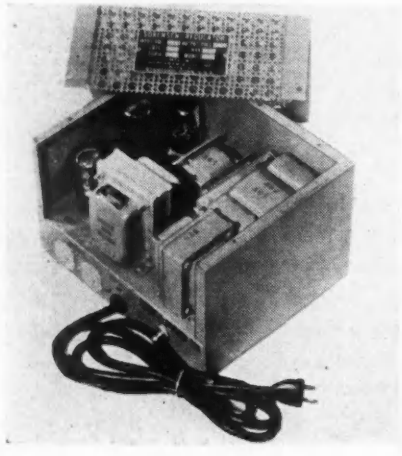
bearings.

An indexed motor plate with time cycle markings is said to assure accurate motor pinion and time cycle mesh at all times. Other refinements include a two-piece timer frame, a new inclined-type signal circuit contact block, solderless terminal clips with insulation grips, and a hinged timer cover.

•

Portable Voltage Regulator Has Electronic Controls

A GENERAL PURPOSE portable a.c. voltage regulator, featuring electronic control circuits and designed specifically for component applications with electrical equipment utilizing light loads, has been announced by Sorensen & Co., Inc., 375 Fairfield Avenue, Stamford, Conn. The new regulator, designated Model 150, has an input voltage range of 95 to 125 volts with an output of 115 volts. Regulation accuracy is ½ of 1 percent and maximum harmonic distortion is 5 percent, the company reports. Other features reported include a load range of 10 percent to 100 percent, a frequency range of 50 to 60 cycles and a power factor range of 70 percent lagging to 90 percent leading. Maximum recovery time is six cycles. The unit is 9 x 7½ x 6 in.



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Inorganic Plastic Softens Above 2,000°F.

AN INORGANIC plastic material usable for circuit breaker housings, switchboard panels, terminal blocks, fuse blocks, etc., has been introduced by Rostone Corp., South Earl Ave., Lafayett, Ind. Known as Rosite, it is said to have a dielectric breakdown of 50 to 80 volts per mil, a surface resistivity of 50,700 megohms per unit area, to have favorable arc resistance characteristics and to be resistant to heat up to 900 deg. F. It has a softening point above 2,000 deg. F.

Chemically, Rosite is a form of calcium aluminosilicate with a microcrystalline grain structure integrally reinforced with asbestos fibre. It has many of the physical characteristics inherent in a stonelike material. It is unaffected by oil, sunlight, alkali, has a compressive strength up to 15,000 psi., and a modulus of rupture up to 7,500 psi. It can be molded in intricate shapes and to close tolerances, the manufacturer reports.

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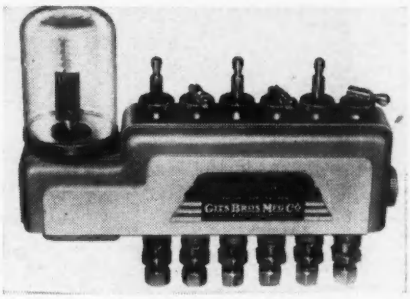
Single Oiling Unit Serves Many Individual Bearings

AN OILING SYSTEM for lubricating multiple remote bearings is being introduced by Gits Bros. Mfg. Co., 1846



South Kilbourn Ave., Chicago, Ill. It is a centralized unit made up of a transparent unbreakable plastic reservoir with a non-spill valve and a main reservoir from which copper tubes lead to the remote bearings.

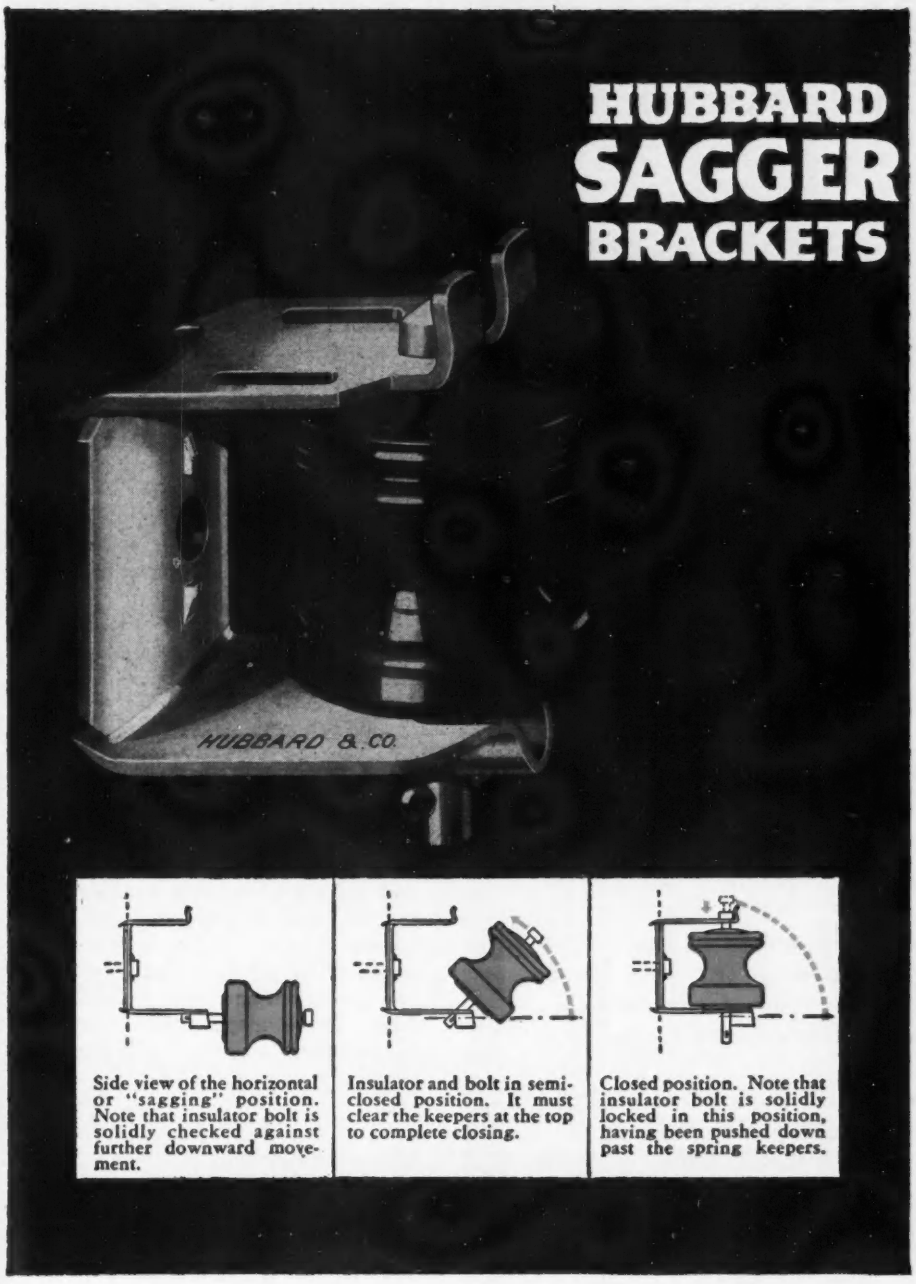
The system includes a series of valves —one for each of the leads—permitting the flow to each bearing to be adjusted individually. Thus one unit can serve more than one machine, or can serve several independent bearings on a single machine.

•

H. F. Quenching Rings Made In Larger Diameters

LARGER quenching rings for use in semi-automatic hardening of gears and similar objects have been announced by Lepel High Frequency Laboratories,

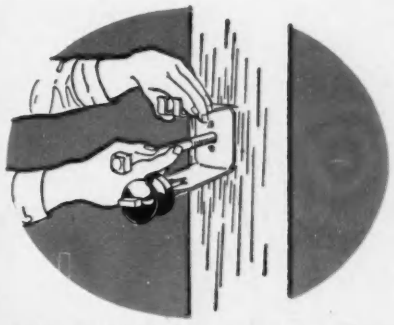
Something **NEW** IN SECONDARY DISTRIBUTION



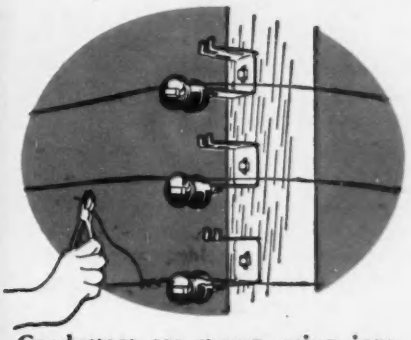
Side view of the horizontal or "sagging" position. Note that insulator bolt is solidly checked against further downward movement.

Insulator and bolt in semi-closed position. It must clear the keepers at the top to complete closing.

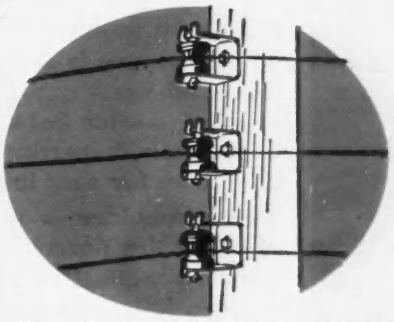
Closed position. Note that insulator bolt is solidly locked in this position, having been pushed down past the spring keepers.



Holes are drilled at correct spacing and machine bolt is inserted as shown.



Conductors are strung, using insulators as pulleys, until desired sag is obtained after which they are tied-in while still in the horizontal position.



After tying-in, the insulator bolts are raised to the vertical and dropped into the lock position.

For secondary distribution circuits, where a variety of problems are to be met, Hubbard No. 710 Sagger Bracket is the most flexible choice to meet the requirements. This Bracket may be described as a single, *separate,* secondary-rack point, which may be used with one or more similar points, at any desired spacing for any number of conductors.

No. 710 Brackets are versatile in other ways also. The patented feature is the arrangement of the insulator bolt which may be dropped to a horizontal position to allow the "sagging" of conductors with the insulator spool acting as a pulley. Insulator Bolts are locked in position when closed or open. Strength against line pull is provided by the broad back bearing against the pole, the backs being 3-inches in width. Spurs at the corners prevent the bracket from turning during and after installation. Bolt heads are trapped in the back to prevent turning while tightening.

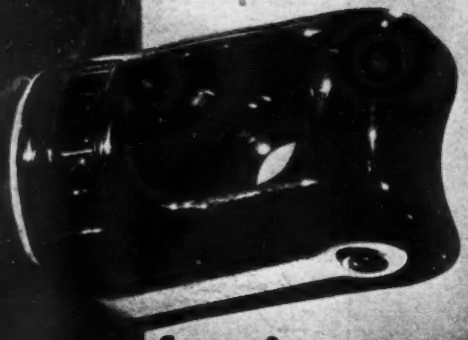
Hubbard Sagger Brackets have been tested and proved in service. Highly adaptable to any conditions, they have drawn praise from engineers, in every instance of the many installations made to date.

HUBBARD AND COMPANY

PITTSBURGH · CHICAGO **OAKLAND · CALIFORNIA**

Look to Locke for Distribution Materials...

Wireholders



for instance...

This is a Locke No. 0611-44 wireholder — one of a complete line—for installing secondary circuits on poles and buildings.

The hardware is accurately formed to fit the porcelain, and has *Permazinc*—Locke's *Quality Controlled* double hot-dip galvanizing—for extra years of dependable performance. Screw threads are sharp and clean for easy installation.

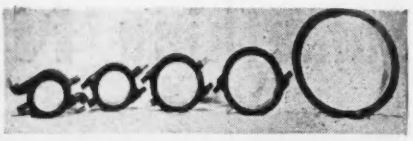
The wireholder is so designed that, when load is applied, the porcelain is in compression for maximum strength. Porcelain is *Compression Glazed* —an original Locke process—for added strength. Hardware and porcelain are designed together and made together to work together.

Complete lines of distribution materials are maintained in six Locke regional warehouses and in most distributors' stocks. Get in touch with your Locke representative.

Depend on Locke for *Quality Controlled* distribution materials—pole line hardware and insulators. *One* order covers *both*.

Locke POLE LINE HARDWARE and INSULATORS

LOCKE INSULATOR CORPORATION • BALTIMORE 3, MD.



Inc., 39 West 60th St., New York 23, N. Y. They are now made in sizes ranging from 4 to 18 in., inside diameter, and are interchangeable. The rings are designed for use in the company's standard Rotoheating and quenching unit and tank and will accommodate circular parts from 2 to 16 in. in diameter.

•

New Pathway Light Provides Safety and Decoration

A NEW PATHWAY light designed for use along walks, paths, and driveways, as well as on docks, steps and porches, has been introduced by Cannon Electric Development Co., 3209 Humboldt St., Los Angeles 31, Calif. It provides a moderate amount of illumination for safety or decorative purposes from the 10-watt bulb, the manufacturer reports.

The complete assembly consists of a head or lighting unit, riser conduit and a canopy base with outlet box, having 7-in. spike. Cylindrical in shape, the 3-in. by 3-in. lighting unit consists of an aluminum cap, lens socket, and yoke section over a socket tube. Crystal polystyrene lens of seven prisms is standard, although various combinations may be made with amber, green, red and blue, including split lens. These may be used for directional purposes through parks or grounds for daytime use as well as night.

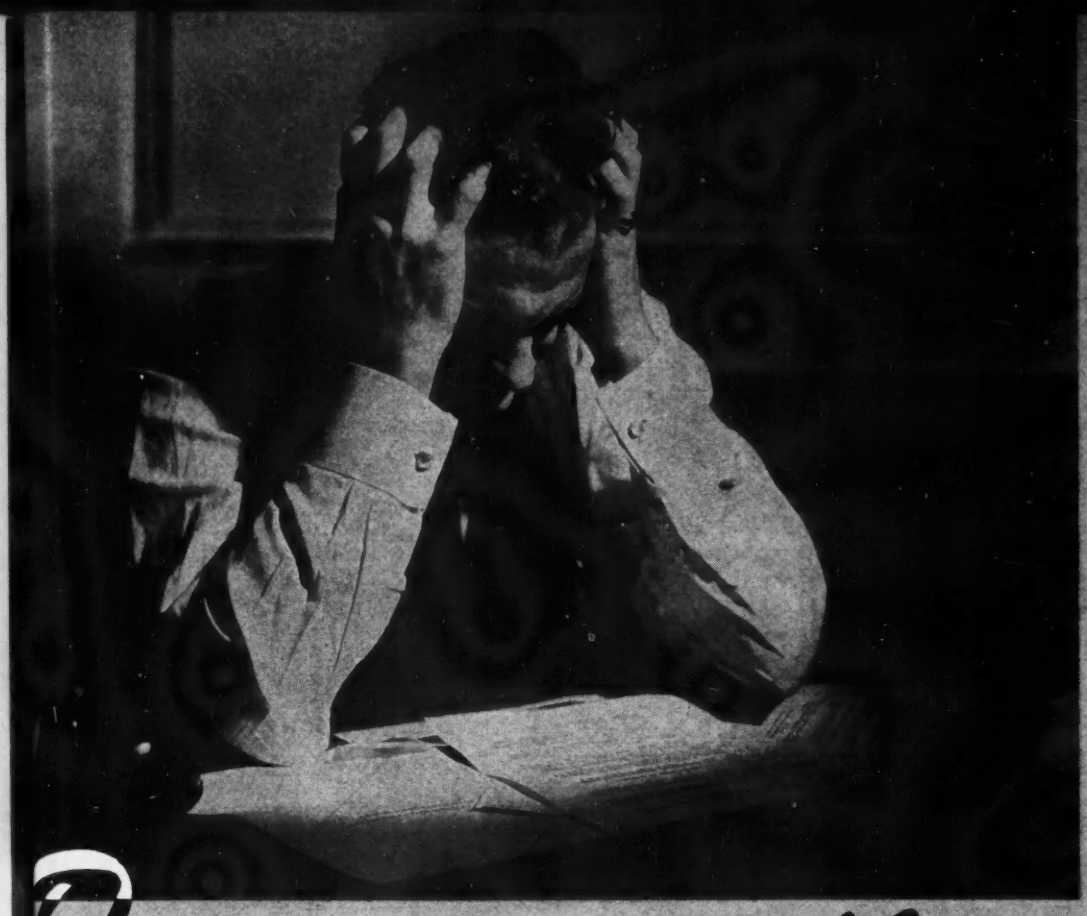
Light unit is furnished for low-voltage or standard 110-volt circuits. Canopy base unit has die-cast aluminum covering over outlet box with 7-in. spike to anchor in soil. Knockouts are provided in outlet box for conduit.

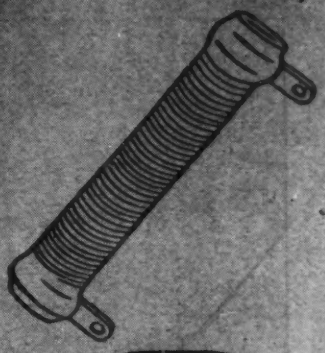
•

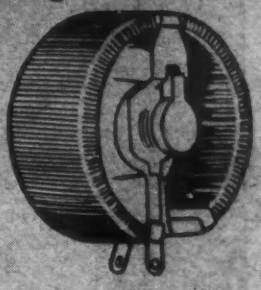
Chain Saw Removes Trees Up to 9 Ft. in Diameter

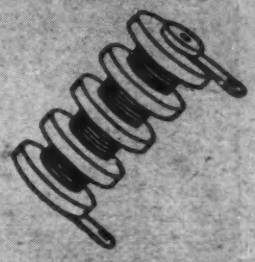
A CHAIN SAW designed especially for utility construction and tree trimming crews has been introduced by Mall

Tool Co., 7752 South Chicago Ave., Chicago 19, Ill. They are available with capacities ranging from 18 in. to 9 ft.







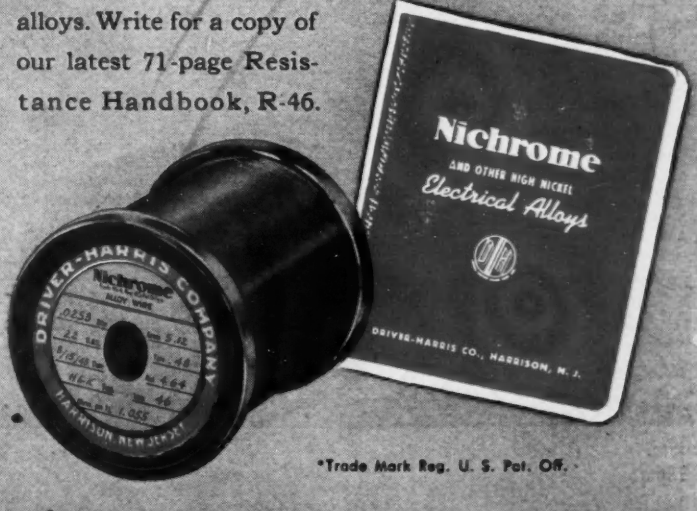


Do resistor problems "BURN YOU UP?"

TIME was when a resistor consisted only of iron wire wound on a ceramic form—but that was long ago. Today, resistance unit specifications are so many and so varied that it requires the most extensive engineering application to solve the difficult problems they often embrace.

Here Driver-Harris lends a helping hand, with more than 80 electrical *resistance alloys,* designed to fill the numerous requirements of the Electrical and Electronic Industries. Best known and most widely used of this populous alloy family are—Nichrome*—Advance*—Manganin—Lohm*—and Midohm*. Singly, or in combination, these alloys are used in the majority of present-day resistance specifications—from precision bobbins to heavy-duty rheostats.

Driver-Harris not only manufacturers and draws the most complete line of resistance alloys in the world—but also knows precisely how to use them. Therefore, when you buy a spool of D-H resistance wire, you also acquire the backing of 46 years of specialized resistance-research experience—and the assistance of our engineering staff to help solve your resistance problems. Get better acquainted with D-H alloys. Write for a copy of our latest 71-page Resistance Handbook, R-46.



Nichrome is made only by

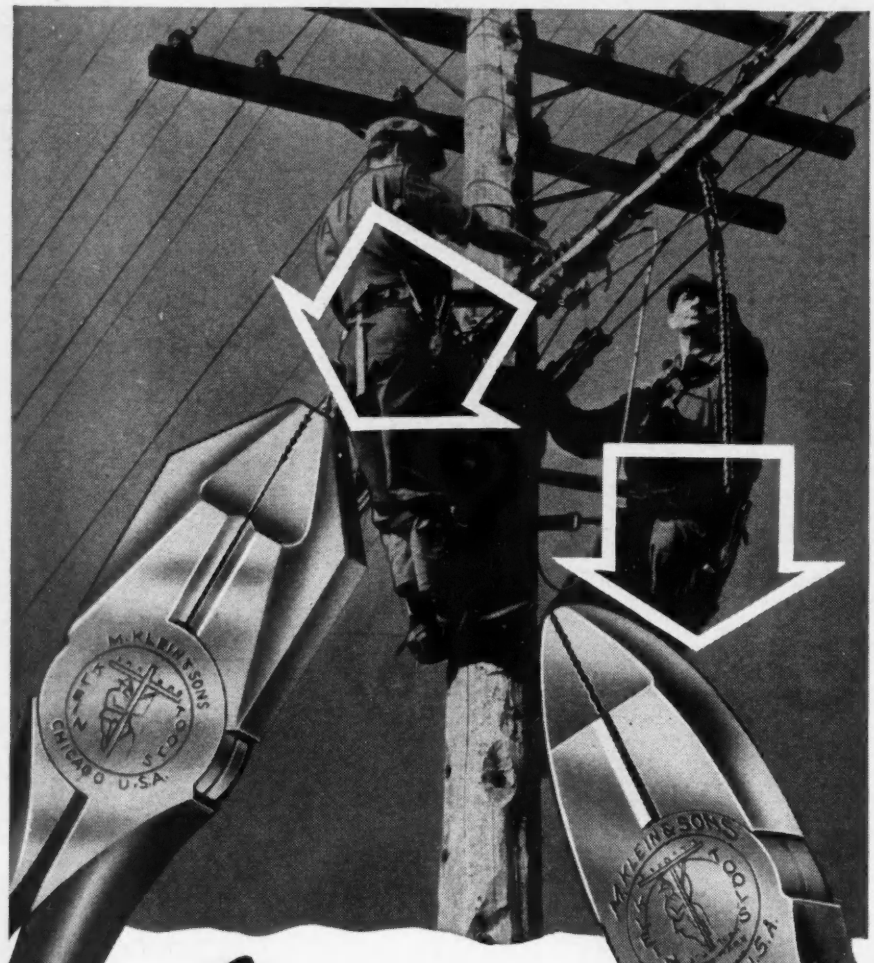
Driver-Harris COMPANY

HARRISON, N. J.

BRANCHES: Chicago • Detroit • Cleveland
Los Angeles • San Francisco • Seattle

The B. GREENING WIRE COMPANY, LTD.
Hamilton, Ontario, Canada

*Trade Mark Reg. U. S. Pat. Off.



Linemen are Kleinmen

• Over the years the men who string and maintain the nation's power and communication lines have come to know and rely on Klein Pliers. That's why you will find Klein Pliers in the hands of the man on the pole—why linemen are Kleinmen.

And there's good reason back of this preference for these quality tools. Drop forged from fine alloy steel, each pair individually tempered and tested, Kleins have just the proper balance . . . just the right spring to the handles to minimize hand fatigue. A fitted hinge keeps jaws perfectly aligned . . . carefully matched knives stay keen.

Keep Klein Pliers on order—your supplier will meet your requirements as soon as possible.

Ask Your Supplier

***Foreign Distributor:* International Standard Electric Corp., New York**

A copy of the Klein Pocket Tool Guide, showing the Klein line and containing valuable tool information, will be sent on request.

Since 1857

Mathias KLEIN & Sons
Established 1857 — **Chicago, Ill., U.S.A.**
3200 BELMONT AVENUE, CHICAGO 18, ILLINOIS

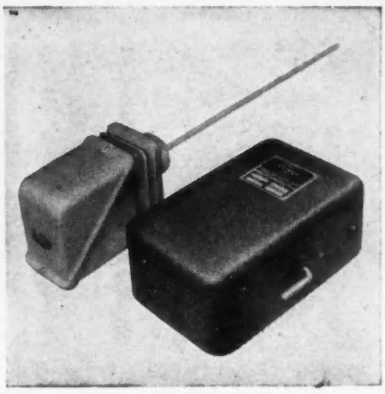
As standard equipment the chain is driven by a 6-hp. gasoline motor; however, for crews carrying auxiliary equipment, the saw may be equipped with electrical or pneumatic motors. Power is transmitted to the chain through an automatic clutch which disengages with overload. The handlebars have a 12-in. spread. The 24-in. size has an over-all length of 4 ft. and a total weight of 78 lb.

The saws are designed to cut poles close to the ground during removal operations and to buck them into convenient handling lengths. They are also designed to fell trees up to 9 ft. in diameter, to remove limbs and to do other type of heavy sawing at the construction site.

•

"Fireye" Boiler Protector Actually "Feels" Flame

A FLAME FAILURE safeguard which actually "feels" the flame is being introduced by the Combustion Control



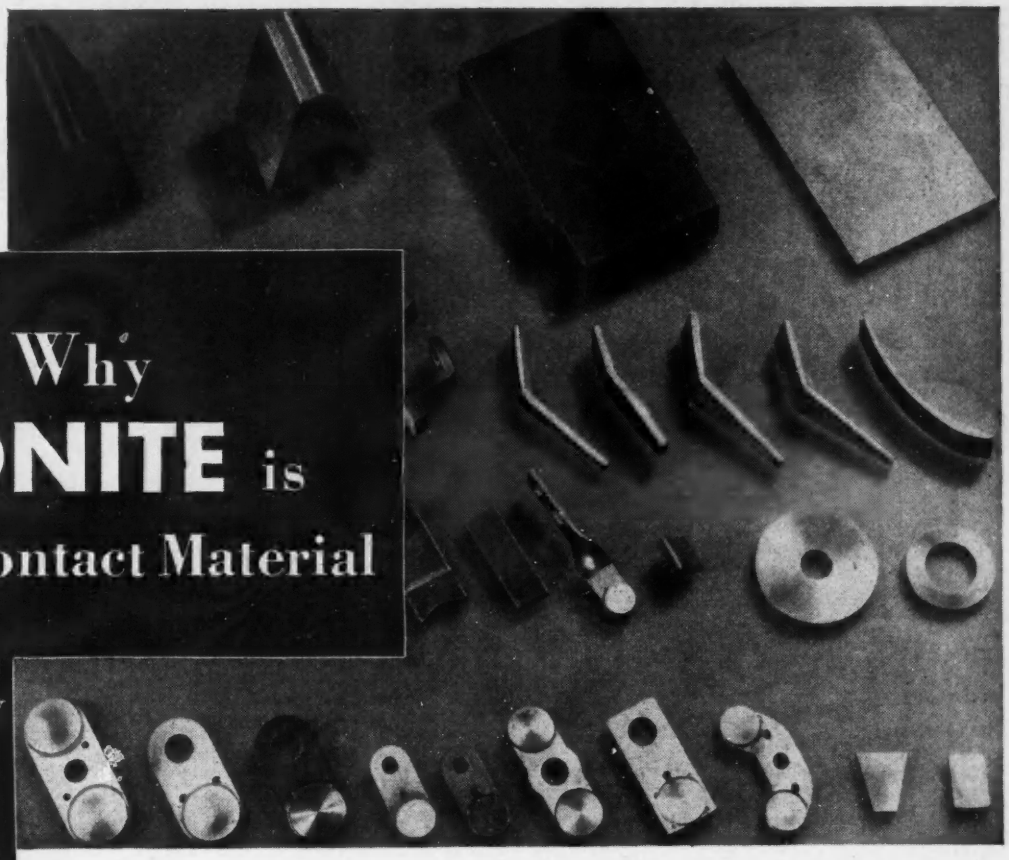
Corp., 77 Broadway, Cambridge 42, Mass. It is recommended for use in industrial ovens, kilns and boilers and is applicable to all types of gas-fired burners.

Known as Electronic Flame Rod Type 45UQ1, it is usable with controls (24PU8) for full automatic burners and with (24PU5) when only operating protection is required. When the flame fails, it cuts off fuel supply and can be wired to sound an alarm. It operates on 115- or 230-volt circuits and has an ambient temperature range of 30-125 deg. F.

•

All-Purpose Test Clamp Grips Flat, Round Conductor

AN ALL-PURPOSE test clamp with a capacity of 200 amp. is being introduced by Trico Fuse Mfg. Co., 2948 North Fifth St., Milwaukee 12, Wis. It is made-up of a finger vise and a

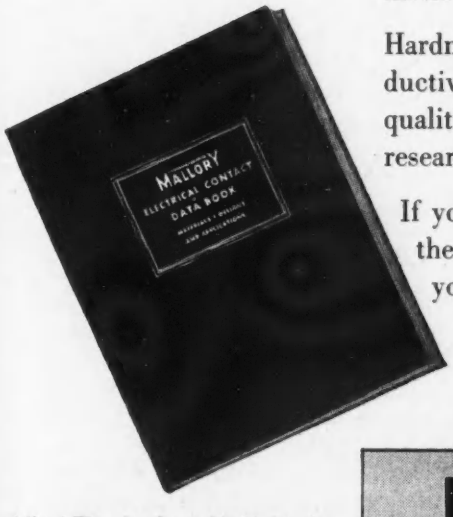


Why ELKONITE is Standard Contact Material for Heavy-Duty Circuit Breakers

Mallory development in powdered metallurgy makes possible the combination of refractory metals like tungsten, molybdenum or their carbides with highly conductive metals like silver or copper. On one occasion it may represent the bonding together of tungsten and copper. On another, silver and molybdenum. But Elkonite* *always* couples maximum life with resistance to severe short circuit arcing conditions. That's why it is standard contact material for most heavy duty circuit interrupting equipment.

Hardness, resistance to mechanical wear and impact, good electrical conductivity, resistance to erosion by arcing, resistance to sticking—these are qualities you can count upon when Elkonite goes to work for you. Mallory research has developed Elkonite so it can be moulded into almost any shape.

If your application calls for contacts of unusual characteristics, send for the Mallory Contact Catalog. Read the facts on Elkonite—then, if you need technical help, our engineers are at your service.



(Above) The only volume of its kind in the world, this Mallory Contact Data Book contains everything you want to know about contact design, construction, application and materials. Free to engineers who write on company letterhead. $2.50 to others.

P. R. MALLORY & CO. Inc.

MALLORY ELECTRICAL CONTACTS & CONTACT ASSEMBLIES

P. R. MALLORY & CO., Inc., INDIANAPOLIS 6, INDIANA

*Reg. U. S. Pat. Off.

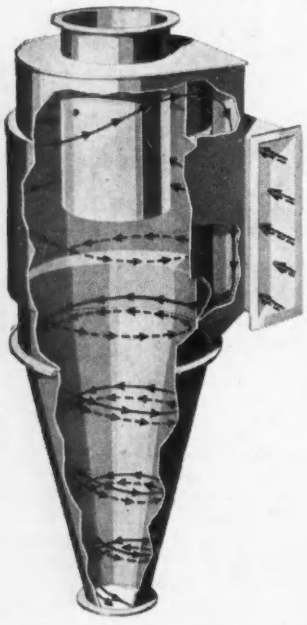
IN DUST RECOVERY . . .

Performance "paved with good intentions" *isn't enough!*

Buell is the champion of Fractional Efficiency Performance Guarantees as the only way to assure the user's after satisfaction.

Dust, inevitably, is a mixture of coarse particles, fine, still finer, and so on down to low-micron sizes. Almost as inevitably, there will be a critically important fraction of certain fines. You HAVE to know that they will be effectively trapped in your dust control apparatus.

Buell tells you in detail! And nothing less than complete Fractional Efficiency Curves present a true picture.



Buell performance is in a class apart because of its design. The patented van Tongeren harnessing of the otherwise mischievous "double eddy" current is at the heart of the matter. The Shave-off is the pay-off!

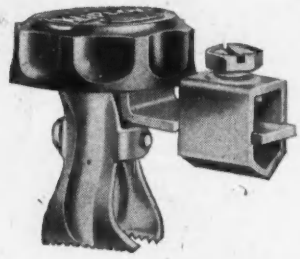
What it is and why it makes so vital a difference is the subject of an interesting exposition in "The van Tongeren System of Industrial Dust Recovery". Free for the asking. Write: Buell Engineering Company, 70 Pine Street, Suite 4900, New York 5,

buell

Engineered Efficiency in DUST RECOVERY

solderless lug.

A twist of the finger-tip knob fastens the clamp on 1-in. round or flate fuse



clips, busbars, terminals, cables, battery posts, etc. The solderless connector accommodates No. 2 wire minimum, No. 0 maximum, and swivels around the clamp. The unit will carry 150 amp. continuously and 200 amp. intermittently.

•

Motorized Valves Designed For Commercial Applications

A NEW motorized valve for commercial applications is being introduced by Automatic Temperature Control Co., 54 East Logan St., Philadelphia 44, Pa. It is adaptable for commercial machinery and equipment, heating and air-conditioning systems, heating and cooling coils, etc.

The unit provides automatic two-position (on-off) operation of valves for steam, air, gas, oil or water. An induction motor develops the power-drive through a worm and spur reduction. The incorporated limit switches are adjustable. The cast iron housing is stated to be dust-tight and splash-proof.

It requires a three-wire thermostat, pressure switch or other similar device for actuation. The electrical connections are made to a terminal block. The unit operates on either 24, 110, or 220-volt, a.c. power source.

Valves supplied are of the Globe-type, all bronze, either single or double seated in sizes ½ to 2½ in., screwed end connections, or the Butterfly-type, iron body, bronze trim in sizes 1 to 4 in., either screwed or flanged ends.

•

Spot, Projection Welders Capacities Up to 500 Kva.

A COMPLETE new line of roller-head, press-type spot and projection welders, ranging from 50- to 500-kva. capacity, has been announced by Progressive Welder Co., 3050 East Outer Drive, Detroit 12, Mich. The company reports that they are equally adapted to continuous high production runs and to

THIS INSULATION

will outlive children not yet born—and their children's children

Father Time meets his match when you protect your hot-spot circuits with Rockbestos A.V.C. wires and cables. Their *permanent insulation* of ageless, impregnated asbestos not only withstands the march-of-time, but the life-shortening destruction of baking heat, rotting fumes, oil, grease, and even flame, because it is practically indestructible.

You'll find Rockbestos A.V.C. paying its way *in the worst places*—where ambient temperatures run high (as over boilers)—where sulphurous fumes rot ordinary cables (as in coal-burning power plants)—and in other installations where you can't afford trouble such as power leads to exhausters, boiler feed and ash slush pumps, precipitators, and forced and induced draft fans.

Solve your maintenance problems *in advance!* Save re-wiring time and cable costs by installing Rockbestos A.V.C. in your *short-life* circuits. 600 to 5,000 volt ratings include lighting and switchboard wires, lead sheathed or armored power and control cables and N. E. Code types. Write for a catalog.

ROCKBESTOS PRODUCTS CORPORATION
214 Nicoll St., New Haven 4, Conn.

ROCKBESTOS A.V.C.

The Wire with Permanent Insulation

ROCKBESTOS A.V.C. 600 VOLT MOTOR LEAD CABLE TYPE AVA

Insulated with impregnated asbestos and varnished cambric and covered with asbestos braid, like single and three conductor power cable, this cable withstands high ambient and conductor temperatures in coil connections, motor and transformer leads. Also resistant to oil, grease, moisture and flame. Sizes 18 AWG to 1,000 MCM.

ROCKBESTOS A.V.C. 600 VOLT CONTROL CABLE

In one to 19 conductors with individuals insulated like Motor Lead Cable, coded cotton braids, and asbestos braid overall unless lead sheath, armor, or lead and armor are preferred. For permanent installations under high temperature and corrosive fumes and elimination of fire hazard. Standard strandings AWG 12—19/#25 and AWG 9—19/#22. Others on order.

125 different permanently insulated wires have been developed by Rockbestos to meet severe operating conditions.

NEW YORK BUFFALO CLEVELAND PITTSBURGH DETROIT CHICAGO ST. LOUIS LOS ANGELES SAN FRANCISCO SEATTLE PORTLAND, ORE.

Crapo
STEEL CONDUCTORS

Because of its high tensile strength, its ruggedness and its conductivity, *Crapo* HTC-130 Steel Conductor is both practical and economical as an overhead ground wire. Its superior strength makes possible long spans with flat sags and greater clearances. Its rugged physical characteristics give it a high fatigue endurance limit, enable it to withstand severe shock and deformation.

The all-'round dependability and economy of *Crapo* HTC-130 Steel Conductor as an overhead ground wire have been established by its performance under actual operating conditions. Leading utilities have adopted it on the basis of their own experience.

• • •

Crapo Steel Conductors are distributed by Graybar Electric Company, Inc. Ask the Graybar representative or write for your copy of the *Crapo* Steel Conductor Manual!

Crapo HTC-130 Steel Conductors for overhead ground wires are available in Standard (3-wire) and Solid types. Physical properties for sizes No. 4 and No. 6 (B.W.G.), in both types, are shown below:

Conductor Size B. W. G.	Type of Construction	Diameter of Conductor (inches)	Minimum Breaking Strength (lb.)
4	3-wire	0.297	5610
6	3-wire	0.252	4295
4	Solid	0.238	5784
6	Solid	0.203	4208

INDIANA STEEL & WIRE COMPANY
MUNCIE, INDIANA

handling of various types and sizes of work on a job-lot run basis.

Provision can be made for pulsation welding, resistance-upsetting and resistance-brazing; also for pre-heating, post-heating or tempering of the work while still in the machine.

Machine operation is obtained through either air or hydraulic actuation, on all sizes up to 250 kva. On larger machines, hydraulic operation is standard. All machine sizes are available with throat depths of 18, 24 or 30 in. (projection welding); 18-36 in. for spot welding.

Size No. 1 machines (50 and 75 kva.) are offered in two styles: a spot welder and a projection welder. The projection welder type machine is convertible for spot welding by adding spot welding horns, electrode holders and electrodes. Sleeves and spacers for the mounting of the horns are provided as standard in the platens. The straight spot welder with its swiveling lower arm is also convertible to projection welding, although this requires the addition of a projection welding type lower knee and upper and lower platens.

Machines ranging from 100 to 250 kva. are offered as combination machines. On these both projection and spot welding can be performed, the machines having T-slot platens and sleeves and spacers for mounting spot welding horns.

TECHNICAL LITERATURE

Standards—"American Standard Abbreviations for Use on Drawings," publication Z 32.13-1946; price $1; obtainable from American Standards Association, 70 East 45th St., New York 17, N. Y. The list of shortened forms of words or expressions for use on drawings (not in text or equations) contains approximately 2,000 terms, to meet present minimum requirements. Symbols are included for cables and chemicals; also abbreviations for engineering societies, trade associations, nationally recognized inspection bureaus, and for Army and Navy terms and words having specific application to these services.

"Radiography in Modern Industry"—An elaborately illustrated stiff-cover publication (122 pages) by Eastman Kodak to explain X-ray technology and teach the technician how to obtain conventional and special radiographs after selecting the film and arranging for successful processing. Price $3 at Kodak X-ray dealers.

Trackless Trolley: New bulletin on trolley coaches contains interesting historical, construction and operation data. Also contains a table which indicates the number of coaches that can be operated economically in cities of different sizes. General Electric Co.

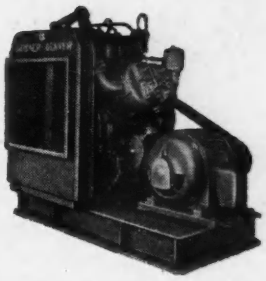
Power Factor—A 214-page book titled "Power Factor in Your Plant," by W. C.

when you need "SECOND WIND"

■ Equipment that slows down or quits when the going gets too tough won't do for long-pull jobs. The Gardner-Denver equipment shown on this page has its "second wind" *built in*. It has the extra capacity to keep going . . . at high efficiency . . . regardless of ground or weather. For complete information, write Gardner-Denver Company, Quincy, Illinois.

With its 67 pounds of speed and power, this Gardner-Denver S73 has the capacity to drill faster in harder ground and to drill deeper holes without the handicap of excess weight. Yet this sinker uses no more air than the average 55-pound drill. Excellent holding characteristics enable the operator to maintain high drilling speed, hour after hour.

Broiling heat or bitter cold won't affect the performance of Gardner-Denver Portable Compressors. That's because their cylinders are *completely* water jacketed for sustained high efficiency, regardless of temperature or altitude. Complete water cooling, too, means less lubricating oil consumption.



With its combination radiator and air-cooled intercooler, this Gardner-Denver "WB" Compressor is ideal where water is scarce or of poor quality. Evaporation of the cooling water is practically nil, so that water seldom needs to be added. Note the compact design.

GARDNER-DENVER

SINCE 1859

A full six-foot change, with something extra for odd steel changes, is readily handled by the Gardner-Denver UM99 Wagon Drill. Vertical holes can be drilled down to a rock face or at any angle with the fully adjustable U-bar of the UM99. The D99D drill blows deep holes efficiently.

BLAW-KNOX
Aquatomic
FOG NOZZLES DO NOT FAIL!

Wide clear passages through the heart of this dependable Fog Nozzle makes it virtually non-clogging--always reliable.

It fights fire with the water available—maintains its fog pattern under low pressures in emergency.

Fine but forceful fog gives maximum cooling and quenching effect and drives to the base of the fire in spite of drafts and turbulence.

Also—

Blaw-Knox offers Standard Wet and Dry Pipe Systems, as well as Thermostatically Controlled Pre-Action and Deluge Systems.

Write for details.

BLAW-KNOX
SPRINKLER DIVISION
829 Beaver Avenue, N.S.,
Pittsburgh 12, Penna.

King, is available from Cornell-Dubilier Electric Corp., South Plainfield, N. J. at $3.00 per copy. The book, written in shop language, explains power factor, effect on electrical equipment, effect on voltage drop, as well as methods of improvment. It also treats cost angles from several viewpoints.

Linemen's Equipment — Safety practices for electric utility linemen with emphasis on the correct use and care of their climbing equipment, are presented in a 30-page manual entitled "Use and Care of Pole Climbing Equipment." It covers recommended methods for handling and maintaining body belt, safety strap, climbers, leg strap and other equipment. The manual prepared by the accident prevention committee, is available from Edison Electric Institute, 420 Lexington Ave., New York 17, N. Y., for 25 cents per copy.

Welding Electrodes — Booklet entitled "Tentative Specifications for Corrosion-Resisting Chromium and Chromium-Nickel Steel Welding Electrodes" is available from American Welding Society, 33 West 39th St., New York 18, N. Y., and American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa., for 25 cents per copy.

Converters—Report on Proposed Standard for Pool Cathode Mercury-arc Power Converters (No. 6), has been published by The American Institute of Electrical Engineers, 33 West 39th St., New York 18, N. Y., for comment and criticism. The standard applies to all types of mercury-arc rectifiers, employing rectifying devices with mercury pool cathodes and used for power conversion purposes, including mercury-arc power rectifiers, mercury arc power inverters, electronic frequency changers and converters. Also included is a supplement on transformer equipment of rectifier units.

D.C. for Aircraft—Proposed Test Code for Direct Current Aircraft Machines (No. 800) has been released by The American Institute of Electrical Engineers, 33 West 39th St., New York 18, N. Y., for one year trial use. The code covers all rotating machines which operate from, or are connected to, a direct-current system of an airplane.

Testing—Report on Recommended Practice for Insulation Resistance Testing of A.C. Machinery (No. 43) has been published for comment and criticism by the American Institute of Electrical Engineers, 33 West 39th St., New York 18, N. Y. The recommendations apply to synchronous generators, induction and synchronous motors, and a.c. fractional hp. motors.

Air Breakers — Published for one year trial use, the Proposed Standard for Low-Voltage Air Circuit Breakers has been published by The American Institute of Electrical Engineers, 33 West 39th St., New York 18, N. Y. The standard applies to air circuit breakers with interrupting ratings over 10,000 amp.

R. R. Crossings—Reports of joint engineering committee of Association of American Railroads and E.E.I. on Crossings of Electrical Supply Lines and Facilities of Steam and Electrified Railroads (publication 0-12) is available from Edison Electric Institute, 420 Lexington Ave., New York 17, N. Y. Covered are principles, practices, specifications, clearances, loading, strength requirements, line insulators, underbridge crossings and underground crossings.

Magnet Wire—Standards for Magnet Wire (publication No. 46-120) are available from National Electrical Manufacturers Association, 155 East 44th St., New York 17, N. Y., for $1.00 per copy. In scope the standards cover round copper magnet wire insulated with a film of baked synthetic resin varnish based on a vinyl acetal resin.

Insulators—Insulator catalog No. 26 issued by Ohio Brass Co., Mansfield, Ohio, contains one section of 22 pages devoted to NEMA and A.S.A. standard insulator tests.

FILM REVIEWS

"Summer Storm," a black and white sound film describing how a utility prepares for emergencies and what steps are taken to maintain continuity of service, is available from the school service department, Westinghouse Electric Corp., Box 1017, Pittsburgh 30, Pa. Since it was made to appeal to non-technical audiences, the picture opens with a brief explanation of the principles of electricity, and describes how current is generated and distributed. It was made in both 16 and 35 mm. sizes and may be borrowed for use in clubs and schools.

"Melting of Huron Die Steel," a picture showing, for the first time, the actual color changes occurring during a heat within the walls of an electric arc furnace, has been released by Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa. The 15-minute film was shot through an open furnace door by use of a telephoto lens.

"Design for Arc Welded Structures," is a picture produced to assist engineers, architects and contractors to visualize the many uses of welding in structure construction. The film has a running time of about 15 minutes and is available in 16 mm sound color prints from Lincoln Electric Co., 12818 Coit Rd., Cleveland 1, Ohio.

•

Wave Lengths Assigned to Utility Firms by FCC

Seventeen channels have been set aside in the 30-40 mc band for the use of radio stations of electric utilities and the petroleum industry, the Federal Communications Commission has announced.

Under the order, all users of frequencies in this band have until July 1, 1950, to locate themselves properly, and the same limit is given to any present users who must vacate.

The channels alloted to the power and petroleum industries are 33.18, 33.22, 33.26, 33.30, 33.34, 33.38, 37.46, 37.50, 37.54, 37.58, 37.62, 37.66, 37.70, 37.74, 37.78, 37.82, 37.86 mc.

The commission also has revealed that data from industry representatives indicate in general that during the first three years of operation of mobile radio equipment, the major replacements consist of tubes; beginning with the fifth year of operation, components other than tubes require replacement; and with the seventh year, the cost of maintenance of equipment is greater than the depreciation on new equipment; and further, that beginning with the fifth year, the service rendered from an operational standpoint begins to be unsatisfactory. This is an especially important consideration in the case of the safety and emergency services.

Light **in weight...**

Light **on space...**

Light **on expense...**

...J-M TRANCELL MATERIALS

for Bus Bar Housings

Bus bar housings go up faster, more economically, when J-M Trancell is used. Trancell is nonmetallic. It is erected *without* water . . . makes a cleaner, neater job . . . and provides a *dry* housing that safeguards against shorts. Completely fireproof, it has a low conductivity that protects adjacent equipment against heat transmission.

These 3 features make J-M Trancell particularly suitable for bus bar housings:

LIGHT IN WEIGHT: Trancell can be fastened to the ceiling by means of clip angles attached to the concrete with expansion bolts. No inserts or other fastening devices are required because of the material's light weight.

LIGHT ON SPACE: Because it is thin, Trancell used to house bus bars conserves space . . . yet this material stands greater impact than other fire-resistant partitions.

LIGHT ON EXPENSE: Bus bar housings are easily and rapidly erected by a small crew of workmen because Trancell is light in weight and easy to handle. In addition, it comes in large sheets that can be cut, drilled, and bolted right on the job . . . is rotproof and rustproof . . . requires no painting and little, if any, maintenance.

You can order Trancell pre-cut to your special dimensions . . . or have it cut by your own maintenance department thereby saving shut-down time, detail drawings, and materials. For full details, write Johns-Manville, Box 290, New York 16, N. Y.

Johns-Manville

TRANCELL
an asbestos product
for housing electrical equipment

NEWS ABOUT PEOPLE

Bryans Elected President of Philadelphia Electric

Horace P. Liversidge, president of the Philadelphia Electric Co. since 1938, has been elected chairman of the board

N. E. Funk

of directors and H. B. Bryans, executive vice-president, was elected president. N. E. Funk, vice-president in charge of engineering, was elected executive vice-president and a member of the board of directors. Mr. Liversidge will continue as executive head of the company.

Mr. Bryans has spent his entire career in the public utility business. He started in the gas branch of the industry, but soon thereafter entered the electric utility field in Gloversville, N. Y. After a connection with the Counties Gas & Electric Co. in Norristown, Pa., he was appointed general superintendent and later assistant general manager of the Philadelphia Suburban Counties Gas & Electric Co. In 1929 he was named vice-president in charge of operations of the Philadelphia Electric Co. and was elected executive vice-president in 1938. Mr. Bryans is a director and past-president of the American Standards Association, president of the Electrical Association of Philadelphia, director of the Edison Electric Institute, and a past-president of the Pennsylvania Electric Association.

Mr. Funk started his business career with the Westinghouse company and later taught at the Georgia School of Technology. He has been with the Philadelphia Electric Co. for many years, and is a national authority on engineering matters. Mr. Funk has been active in the affairs of many important national associations and societies, including the American Institute of Electrical Engineers, of which he is a past national president; the American Society of Mechanical Engineers, of which he is now a vice-president; the Association of Edison Illuminating Companies; the Edison Electric Institute and the Pennsylvania Electric Association.

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B. A. Berlin Made President of Heinemann Electric Co.

Bernard A. Berlin has been named president of the Heinemann Electric Co., Trenton, N. J. In this office he is succeeding his father, B. S. Berlin, who died recently.

A graduate of Penn State College, with a bachelor of science degree in electrical engineering, Mr. Berlin spent three years in the Signal Corps and more than a year in ETO as field radio officer. After discharge, he joined the E-Z Electric Manufacturing Co., Chicago, as production engineer, serving in that capacity until 1946, when he joined Heinemann Electric.

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► Gordon Evans, formerly president of the Missouri Edison Co. and the East Missouri Power Co., is now assistant to the president of the Kansas Gas & Electric Co. at Wichita. Mr. Evans entered upon his public utility career in 1924 with the Public Service Co. of Oklahoma at Tulsa. A subsequent connection was with the Oklahoma Power & Water Co., which he served in the capacity of secretary and treasurer and later vice-president before he joined the Missouri Public Service Co. in 1937 as vice-president and secretary, rising to the position of operating vice-president. It was in 1941 that he became president of the two Missouri utilities.

► Richard P. Brown, chairman of the board of the Brown Instrument Co., has been awarded the honorary degree of doctor of engineering by Drexel Institute.

West Kootenay Power Elects R. W. Diamond President

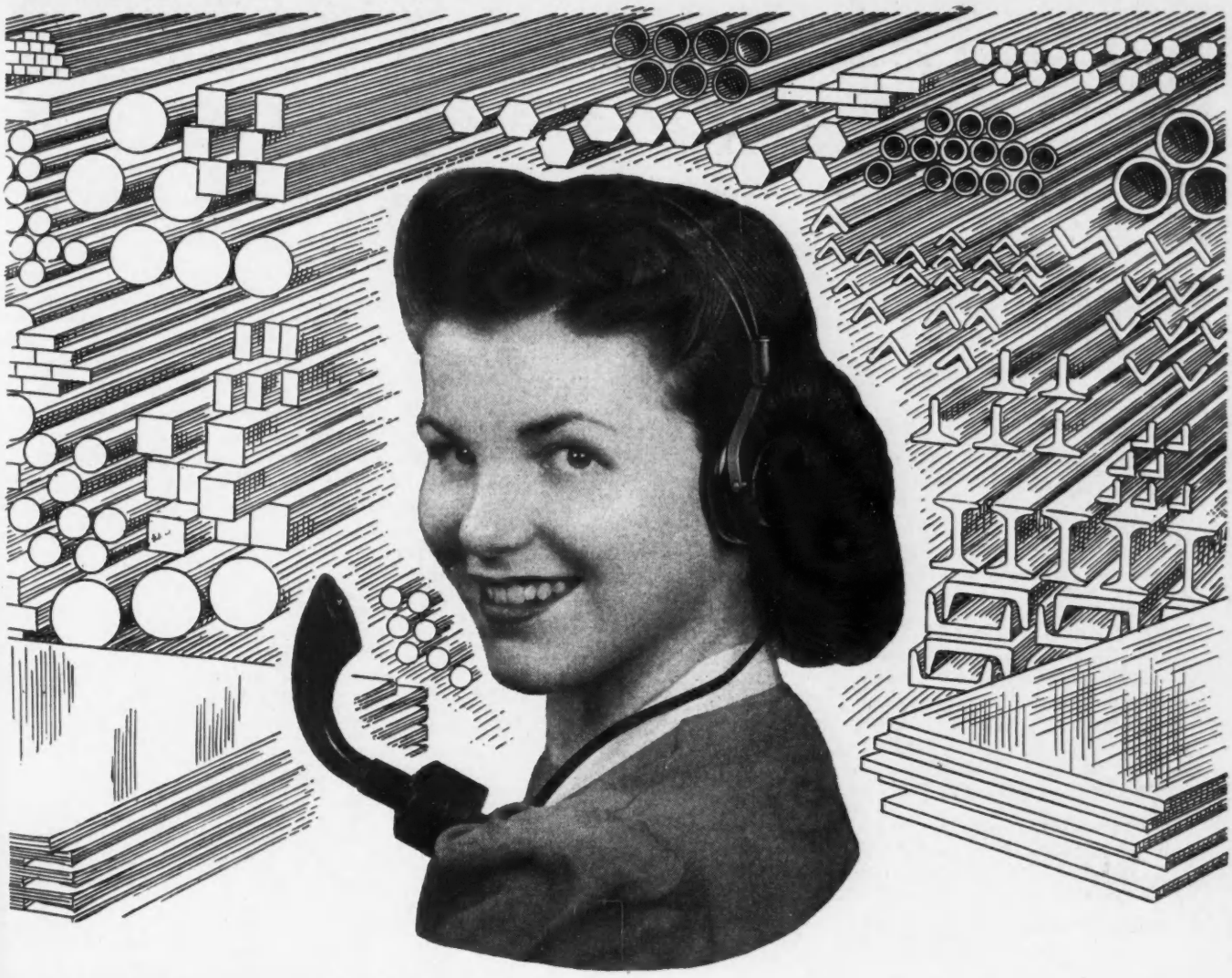
Announcement of the election of Randolphe W. Diamond as president of the West Kootenay Power & Light Co., Ltd., has recently been announced. Mr. Diamond has been associated with the Consolidated Mining & Smelting Co. of Canada, Limited, Trail, B. C., since 1917.

After being made superintendent of concentration until 1929, he toured Europe during the winter of 1929 and 1930, studying nitrogen fixation and chemical fertilizer production methods, following which he cooperated in the design and construction, and was responsible for the operation, on completion, of the $10,000,000 group of

R. W. Diamond

plants built for the production of chemicals and chemical fertilizers, at Trail. After holding various operating positions, he was appointed vice-president and general manager in 1945. Previously he was with Anaconda Copper Mining Co.

Mr. Diamond was Leonard Medallist 1935 (Engineering Institute of Canada). He is a member of the Institution of Mining and Metallurgy (London), a member of the American Institute of Mining & Metallurgical Engineers, a member of the Canadian Institute of Mining & Metallurgy and a member of the Engineering Institute of Canada, the Australasian Institute of Mining and Metallurgy, and a member



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NEW 5-WAY BINDING POST SERVES ALL

Offering complete insulation . . . current capacity of 30 amperes . . . working voltage of 1000 volts; the new Superior Binding Post type DF30 meets the need for a multi-purpose electrical connector.

Features Five Connections

1. Permanent clamping of wire up to #12 through the center hole.
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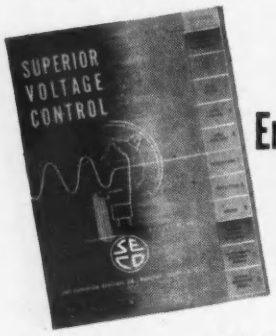

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Just released . . . Bulletin 547 complete with ratings, detail drawings, performance and engineering data on POWERSTAT variable transformers and STABILINE Voltage Regulators. Get your copy.

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947 LAUREL STREET
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of the Association of Professional Engineers of the Province of British Columbia.

•

Pennsylvania Utility Elects New Vice-Presidents

Pennsylvania Water & Power Co., Baltimore, has announced the election of George W. Spaulding, vice-president,

G. W. SPAULDING

to the position of executive vice-president and of Donald Gunn and J. U. Diehl as vice-presidents. All of these men have been with the company for many years.

Mr. Spaulding is also a director of the company. Mr. Gunn has been chief

D. GUNN

engineer of the company and his duties in this capacity continue.

Mr. Diehl has been treasurer of the company since 1944 and continues to handle those duties.

•

► GLEN D. HAYWORTH, superintendent of the municipal light plant at Crawfordsville, Ind., has resigned.

Puget Power Names Karrer Executive Vice-President

Designation of L. E. Karrer to the position of executive vice-president of Puget Sound Power & Light Co. and its subsidiary companies, has been announced recently. Mr. Karrer, vice-president of the company since 1942 and manager of North Coast Transportation Co. since 1939, has had long and varied experience in the electric utility field.

Mr. Karrer became identified with the company in 1927 as a meter tester in its Seattle offices. In line with his engineering background he became, successively, a student engineer and assistant engineer with the company's engineering department. In 1931 he was made assistant to the vice-president. In succeeding years he was promoted to positions of greater executive capacities.

During the war period Mr. Karrer

L. E. KARRER

represented Pacific Northwest industry on various governmental control boards. He is at present a member of the Edison Electric Institute, the Northwest Electric Light and Power Association. He is serving on the Board of Trustees of the Seattle Chamber of Commerce and is chairman of the Chamber's industrial committee, now actively engaged in encouraging the establishment of new industry in this area.

Appointment of L. A. Williams, vice-president, as manager of the central division with headquarters at Seattle, succeeding Frank Walsh who becomes manager of the southern division, has been announced. These changes were brought about because of the retirement of A. M. Chitty, long-time southern division manager. Mr. Williams, who continues as vice-president in his new managerial capacity, joined Puget Power in 1934 as assistant to the president. Frank Walsh, who will make his home at Olympia as the new man-

ager from 1932 until 1936 when he moved to the same position at Bellingham. In 1941 Mr. Walsh was transferred to Seattle as central division manager. He joined the organization in 1912.

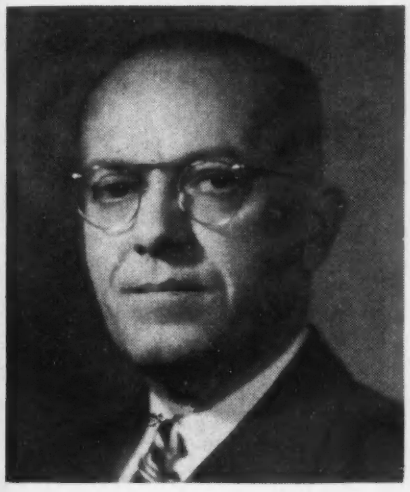
Mr. Chitty's retirement culminates a career covering 56 years in the electric utility business, 45 of which have been in association with Puget Power and its predecessor companies.

•

E. R. Monesmith Assumes New Executive Duties

The Crouse-Hinds Co. has announced the appointment of E. R. Monesmith as general sales manager with headquarters at Syracuse, N. Y.

At the same time R. P. Northrup was



E. R. MONESMITH

appointed assistant to the general sales manager.

A. F. Hills, vice-president, continues as director of sales.

•

▶F. BAYARD CULLEY, vice-president and general manager of the Southern Indiana Gas & Electric Co., Evansville, Ind., has been appointed by Gov. Ralph T. Gates to the Indiana Economic Council for a three-year term.

▶ALEXANDER MATIUK, formerly power plant project engineer for Ebasco Services, Inc., New York, has joined Douglas M. McBean, consulting engineer of Rochester, N. Y., as power engineer for the design and engineering of steam electric and boiler plants.

▶JOHN DIERDORFF, advertising supervisor of the Pacific Power & Light Co., Portland, Ore., has been elected vice-president of that utility. Responsibilities of his new position will include

They checked and found that every square foot of Blaw-Knox Steel Grating has these advantageous features:

1. *One-piece* electroforged construction develops the full strength of all sections of metal used in manufacture.
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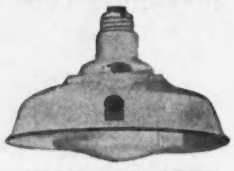

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PORCELAIN ON STEEL "ABolite" REFLECTORS

Quality that meets every lighting requirement has always been the watchword of "ABolite" Reflectors. They are recognized throughout the lighting field for flawless construction, durability, ease of installation and maintenance.

A few of the standard types are shown. The complete "ABolite" line includes other types for outdoor use, protective lighting, sports and parking areas, filling stations and sign lighting. For every application where high efficiency with porcelain on steel enameled reflectors and floodlights is required.

ABolite Reflectors are sold exclusively through electrical wholesalers. Catalog for specifications sent on request.

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PORCELAIN ON STEEL

THE JONES METAL PRODUCTS CO., West Lafayette, Ohio

UP IN THE AIR PROTECTION

AERIAL TENTS

When the going is tough and the weather is as changeable as the proverbial wind, your crew, working within a Cope Aerial Tent, will not be hampered by *any* weather conditions.

The sturdy aerial tent measuring 52" x 48" hangs a full 8' 8" to give plenty of headroom and ample overhang below the platform. The tent itself is made of 10-oz. U. S. Army duck supported on a frame of fabricated steel and pipe sections, which, by a patented device, securely locks on the messenger strand. The entire unit folds into a compact bundle for convenient handling and storage.

Built to take it, the Cope Aerial Tent will provide long, protective service—your crews are bound to work with greater efficiency when this very necessary equipment is supplied.

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UNDER THE GROUND PROTECTION

GROUND TENTS

To give your ground crews *indoor* working conditions *out-of-doors* provide them with Cope Ground Tents. They are insurance against wind, rain and sun—the hampering effects of the elements!

The Cope Ground Tent stands 6' 9½" square and 6' 5" high with an additional flap 1' 3½" wide extending all around the manhole for added ground coverage. The frame of extra heavy pipe is completely welded and galvanized. The tent, of 10-oz. U. S. Army duck, will withstand plenty of hard use. For ease of handling and storage the complete unit folds into a compact bundle.

For an *outdoor efficient* workplace—"snug as a bug in a rug"—equip your crews with Cope Ground Tents!

It Pays To Specify Cope

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CABLE INSTALLATION & MAINTENANCE TOOLS & EQUIPMENT

general supervision of the company's advertising and publications. He has been with Pacific Power & Light and its affiliates since 1933.

•

Clark Elected President of Plastics Industry Society

George H. Clark, vice-president in charge of engineering of the Formica Insulation Co., Cincinnati, was elected

G. H. CLARK

president of the Society of the Plastics Industry at the recent meeting of the society in Chicago.

Mr. Clark, who has been identified with many developments in the plastics field, both for the Formica company and in the industry, has been associated with the Cincinnati company for 21 years. Previous connections included Crosby Steam Gauge & Valve Co., Merriman Bros. and Waltham Watch Co.

He is a member of the laminated synthetic products section of the National Electrical Manufacturers Association and a member of the sub-committee of non-metallic materials for aircraft of the National Advisory Committee for Aeronautics.

•

► ALBERT R. GRANGER, regional vice-president of the Philadelphia Electric Co. at Chester, has retired after more than 55 years of service. He is the company's longest service employee. After holding various operating positions, Mr. Granger was made vice-president and general manager of the Delaware County Electric Co. in 1914, a position he continued to hold when, in subsequent years, the various independent electric companies were amalgamated into the Philadelphia Electric Co. In addition to his many responsibilities as a utilities executive, he found time for such diversified appointments as commissioner of navigation

from Delaware County and the presidency of the Delaware County Chamber of Commerce. Mr. Granger was instrumental in the founding of the Pennsylvania Electric Association and served as its third president.

•

Boehne and Chu Appointed M.I.T. Assoc. Professors

Two associate professors of electrical engineering have been appointed by the Massachusetts Institute of Technology.

Eugene W. Boehne, coordinator of research and development at the Philadelphia works of General Electric Co., will succeed Prof. W. H. Timbie, head of the M.I.T. cooperative course in electrical engineering (involving extensive training in industry during the undergraduate period), who retired in June after 28 years of service.

The new appointee is a fellow in the American Institute of Electrical Engineers and has received numerous awards for his papers on engineering subjects. His work on circuit breakers has twice brought him the Charles A. Coffin Award.

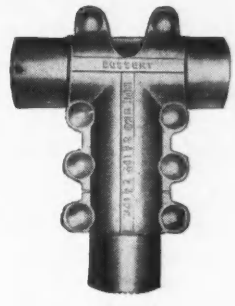
Dr. Lan Jen Chu, the second appointee, has engaged in wave transmission research for about nine years, has been consultant in M.I.T.'s radiation laboratory and in the radio research laboratory at Harvard University, and has been connected with the Institute's research laboratory of electronics.

•

▶E. L. MILLER has been appointed superintendent of distribution and transmission of the Northwestern Electric Co., Portland, Ore., following the retirement of D. A. HORD, who has been associated with the company for 34 years. Mr. Miller has been identified with Northwestern since 1925.

▶A. B. GIBSON, founder and president of the Gibson Electric Co., Pittsburgh, Pa., was awarded the honorary degree of doctor of engineering by the Clarkson College of Technology, Potsdam, N. Y., at the recent graduation exercises.

▶JAMES E. WILLEY, division engineer in the Harrington (Del.) division, of the Eastern Shore Public Service Co., has been promoted to the position of superintendent of the meter and relay department in Salisbury. Mr. Willey has served the company in Millington, Md., and in Laurel and Seaford, Del., before going to Harrington. He succeeds THOMAS C. ROE, who has been promoted to the position of assistant industrial sales manager. FRANCIS L. MCKEE of Dover, Del., has succeeded



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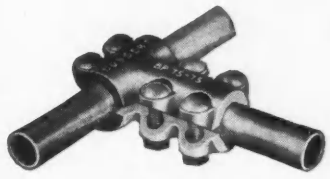

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Whatever way you buy tape, you'll find Gold Seal always just right in "tack"; clean handling; non-raveling; non-peeling. Try it. Jenkins Bros. (Rubber Div.) 80 White Street, New York 13.

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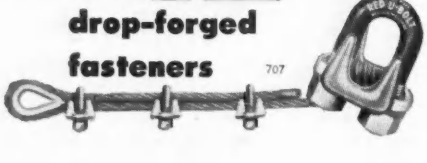


Mr. Willey as division engineer in the Harrington division. Mr. McKee was previously associated with the Philadelphia Electric Co.

▶ GEORGE A. SCHERRY has been appointed chief electrical engineer at the La Grange, Ill., plant at Grayhill, Chicago. Prior to the war, Mr. Scherry was associated with the Ohio Carbon Co. in the capacity of sales engineer. During the war he served with Pioneer Gen-E-Motor Corp. in electrical equipment development. Immediately before joining Grayhill he was in charge of engineering and production for the Garner Electronics Corp., Chicago.

▶ EDWARD R. TAYLOR has been appointed merchandising manager, Hotpoint Inc., Chicago. Mr. Taylor goes to Hotpoint from Zenith Radio Co. In his newly created position, Mr. Taylor will direct all of the company's advertising, sales promotion, sales planning, sales training, and kitchen planning activities. Before joining Zenith, Mr. Taylor was associated with automotive advertising and merchandising for General Motors since 1924.

▶ M. O. STOCKLAND, JR., has been made manager of the newly consolidated sales promotion and advertising departments of the Four Wheel Drive Auto Co. The appointment followed the retirement of FRANCIS M. HIGGINS as advertising manager. Mr. Stockland has served as sales promotion manager since the organization of that department in 1946.

▶ E. M. FLANNERY, vice-president of the Bush Manufacturing Co., Hartford, Conn., has been elected president of the Refrigeration Equipment Manufacturers Association. Mr. Flannery succeeds H. F. SPOEHRER, vice-president of the Sporlan Valve Co., St. Louis, who becomes a member of the association advisory board.

▶ C. H. STANTON, formerly with General Electric Co. in Schenectady in the commercial general division of the ap paratus departments, has been made assistant manager of the Orlando, Fla., city utility system. Mr. Stanton was graduated from the University of Florida in 1940 with a degree in mechanical engineering. He then joined the General Electric staff.

▶ H. B. WALTERS, formerly assistant works manager at Pittsburgh, has been named works manager of the Allis-Chalmers Manufacturing Co.'s Boston Works. Mr. Walters has been connected with A-C since 1922.

OBITUARY

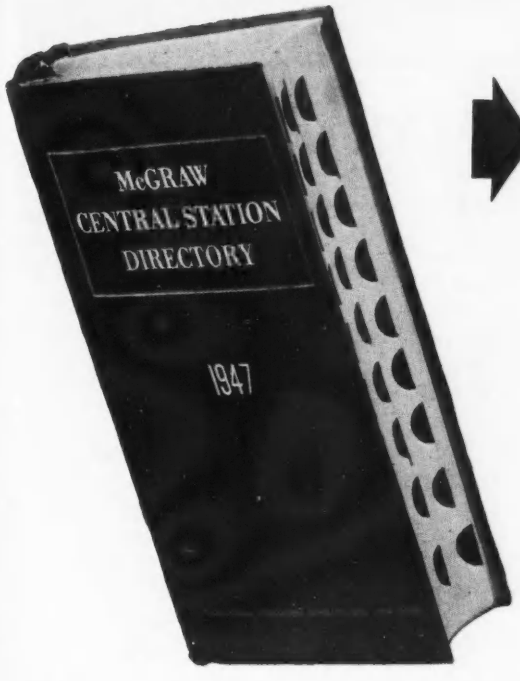
▶ JOHN VAN VEEN, assistant manager of the electric department of the Cincinnati Gas & Electric Co., and a veteran employee, died on June 9 in Cincinnati, Ohio, at the age of 58. Mr. Van Veen joined the company in 1913 as an electrician with the electric production department. Three years later he became chief electrician of production, rose to superintendent of the electric operating department, and in 1946 was promoted to assistant manager of the electric department. Mr. Van Veen was born in Amsterdam, Holland, and received his technical training in Holland. He was a member of the A.I.E.E. and the Society of Professional Engineers of Kentucky and Ohio.

▶ WILLIAM J. MACPHERSON, vice-president in charge of public relations of the Public Service Co. of Northern Illinois, Chicago, died suddenly on June 23 of a heart attack. He was 54 years old. Mr. MacPherson joined the Public Service Co. in 1911 and was made a vice-president in 1941. Well known in the field of public relations, Mr. MacPherson was a former president of the Industrial Relations Association of Chicago and was also active in the American Management Association and the Illinois Manufacturers Association.

▶ CLARENCE M. LECOUNT, consultant to General Electric Co.'s federal and marine section of the industrial department for the Pacific district, died May 29 after a short illness. He was 61. Born in Henry, S. D., Mr. LeCount was graduated from Stanford University in 1911 and immediately joined G. E. in Schenectady, N. Y. Two years later he returned to San Francisco and for 20 years had been well known in west coast shipping circles. Among his original jobs was the installation of some of the early double reduction geared turbine units on the Santa ships for the Grace Line. He was a member of the American Institute of Electrical Engineers, Society of Naval Architects and Marine Engineers and the American Society of Naval Engineers.

▶ LOUIS W. KEMPF, assistant director of research for the Aluminum Co. of America and inventor of a number of alloys and processes, died in Cleveland, Ohio, on June 15. Mr. Kempf had been associated with Alcoa for 23 years and wrote many technical papers and metallurgical treaties regarded as standard references in the aluminum industry.

▶ HENRY B. HARDIN, 41, assistant to the vice-president of the Puget Sound Power & Light Co., Seattle, died April 24.



Presenting the 1947 edition of the

McGRAW CENTRAL STATION DIRECTORY

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This latest, most accurate coverage of changes in electric utility operations and personnel is published for those who work in or sell to the electrical utility industry.

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The 1947 edition of the McGraw Central Station Directory lists in one compact volume every discoverable change in the electric utility industry during the past 12 months. Changes in personnel and operations up to April 1, 1947 and other exclusive data on organization, areas served, generation and distribution equipment are included for each of 4,000-odd utility plants in the U. S., Canada and U. S. possessions.

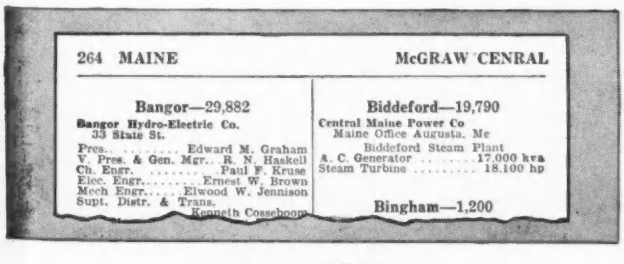
Facts Presented:

1. Names and addresses of private and municipally operated electric light and power companies in the U. S., Canada, and U. S. possessions; also government-controlled projects.

2. Names and addresses of affiliated, holding, controlling or managing and service companies with complete lists of properties controlled or managed by each, and including names and addresses of principal officials.

3. Names and addresses of officials and chief operating men for all operating companies, including:

- Presidents
- Vice Presidents
- General Managers
- Superintendents of Distribution
- Mechanical Engineers
- Commercial or New Business Managers
- Superintendents of Transmission
- Plant Superintendents
- General Superintendents
- Purchasing Agents
- Division or District Superintendents
- Chief Engineers
- Electrical Engineers
- Plant Engineers
- Merchandising Managers
- Division or District Managers



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Pres. ..... Edward M. Graham
V. Pres. & Gen. Mgr. .. R. N. Haskell
Ch. Engr. ..... Paul F. Kruse
Elec. Engr. ..... Ernest W. Brown
Mech Engr. ..... Elwood W. Jennison
Supt. Distr. & Trans. ..... Kenneth Cossehoom

Biddeford—19,790
Central Maine Power Co
Maine Office Augusta, Me
Biddeford Steam Plant
A. C. Generator ..... 17,000 kva
Steam Turbine ..... 18,100 hp

Bingham—1,200

Sample page of Directory.

REA Co-ops Listed:

REA co-operatives are again listed separately in the back of the Directory. This list includes new co-operatives energized during the past year.

Use by Utilities:

The directory is used by hundreds of utility executives who wish to know about:

1. The organization of other utilities, especially those in their own or adjoining areas.
2. Movements of officials from company to company.
3. Discernible trends in expansions of operations of other utilities.

Use by Manufacturers:

Manufacturers of electrical generating, transmission and distribution equipment, and manufacturers of general equipment and supplies, all serving the vast utility industry, make constant use of the directory for

1. Names and addresses of executive, supervising, managing and engineering officials.
2. Determining electrical characteristics of plant, equipment and lines now in use.
3. Knowledge of scope of operations: generating capacity, towns and number of meters served, etc.
4. For each operating company, the following information is presented:

- Company total and plant individual generating capacity in kva. or kw.
- Kind of prime mover and capacity in hp.
- Amount of power purchased in kw hrs.
- Type of current distributed, No. of wires, phase, voltage and cycle.
- No. of meters served.
- Location of power plants.
- Complete list of towns (of 500 population or over) served.
- A complete alphabetical index of companies listed.

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MANUFACTURERS & MARKETS

Induction Heating Section Established under NEMA

A new electrical product group, known as the Induction and Dielectric Heating Apparatus Section, has been set up by eleven manufacturers as a part of the National Electrical Manufacturers Association organization.

H. B. Osborn, Jr., sales manager, Tocco Division, Ohio Crankshaft Co., Cleveland, is chairman of the section. C. W. Miller, sales manager, Industrial Electronics Division, Westinghouse Electric Corp., Baltimore, is vice-chairman.

"The section was formed," Dr. Osborn points out, "to insure greater benefits to the user of high-frequency heating equipment, as well as the manufacturer. These, we feel, can best be achieved through a pooling of ideas. The section, for example, will set up equipment standards and ratings, safety requirements, and many other factors also pointing the way to greater efficiency, increased production, lower costs, faster deliveries, and improved service."

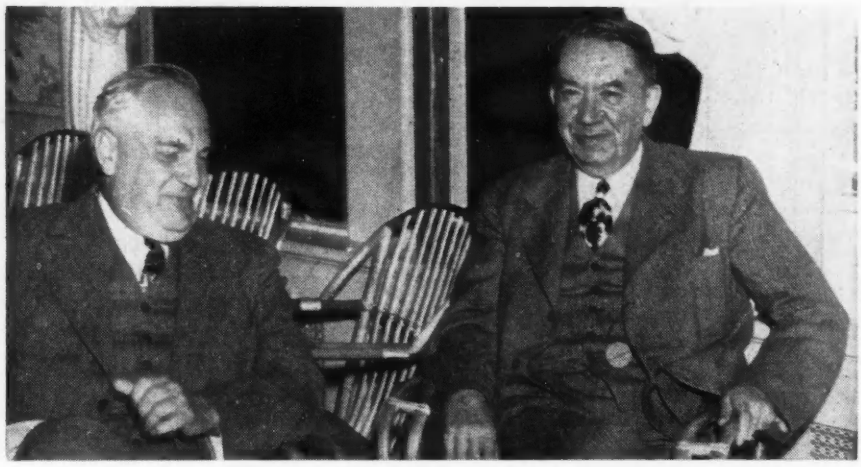
The section is defined as encompassing "induction and/or dielectric heating apparatus together with accessories, excluding renewal parts, physio-therapeutic apparatus, and motor generator sets and generators except when sold as parts of any complete induction and dielectric heating installation."

Kinn Engineering Head

To handle technical aspects for the section, a General Engineering Committee has been established under the chairmanship of T. P. Kinn, manager Industrial Electronics Engineering, Westinghouse, Baltimore.

Also formed was a Federal Communications Committee, the chief purpose of which is to keep in touch with FCC on matters of mutual interest. Chairman of the committee is K. E. Kjolseth, manager of sales, Induction and Dielectric Section, Industrial Heating Division, General Electric Co., Schenectady; and vice-chairman is J. W. Cable, director of research and development, Induction Heating Corp., New York.

Otto Weitmann, vice-president of the Lepel High Frequency Laboratories, Inc., is chairman of the Statistical Committee.



RELAXING—H. F. McRell, left, manager of the transformer division, General Electric Co., and L. R. Brown, retiring manager, take it easy before a recent testimonial dinner to Brown given by G.E. executives and department heads

Representatives of other companies affiliated with the section are: C. R. Dernbach, Allis-Chalmers Manufacturing Co.; F. A. Wright, Cutler-Hammer, Inc.; George Lewis, Federal Telephone & Radio Corp.; Boyd R. Hopkins, Thermex Division, Girdler Corp.; William G. Ellis, RCA Victor Division; C. J. Collom, Weltronic Co.

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Relay Makers Organize to Secure Standardization

With its goal the establishment of a code of standards by which electrical relays may be tested and rated, the National Association of Relay Manufacturers has been organized by twelve relay manufacturers. Additional members will be added from the some 80 manufacturers who comprise the industry.

Ralph T. Brengle, Potter & Brumfield Sales Co., Chicago, first president of the new organization, points out that a number of efforts toward standardization of relay ratings have been made by individual companies. These have never been accepted industry wide; so buyers may receive widely differing relays from two manufacturers although published specifications are identical.

Other officers are C. P. Clare, C. P. Clare & Co., Chicago, vice-president, and J. J. Rowell, Guardian Electric Manufacturing Co., Chicago, secretary-treasurer.

In addition to the three companies already mentioned, these companies were represented at the organization meeting: Advance Electric & Relay Co., Los Angeles; Allied Controls, New York; Automatic Electric Manufacturing Co., Mankato, Minn.; Control Corp., Minneapolis; Leach Relay Co., Los Angeles; Potter & Brumfield Manufacturing Co., Princeton, Ind.; Price Electric Corp., Frederick, Md.; Struthers-Dunn, Inc., Philadelphia; Phillips Control Corp., Chicago; and R.B.M. Manufacturing Co., Logansport, Ind.

•

Johns-Manville Arranges for $25,000,000 Credit

The Johns-Manville Corp. has entered into an agreement with the Metropolitan Life Insurance Co. and the Mutual Life Insurance Co. of New York for long-term borrowing under which loans up to $25,000,000 may be received, Lewis H. Brown, chairman of Johns-Manville, has announced.

Under the credit arrangement, which will provide funds for any new projects for cost reduction, growth or improvement started during the next three and one-half years, Johns-Manville will receive immediately $5,000,000 at an interest cost of 2.7 percent. The com-

pany may obtain further advances totaling $20,000,000 at any time up to December 31, 1950.

Mr. Brown stated that the credit arrangement will not be used for the company's current expansion and improvement program, which includes three new plants well on the way toward completion. Funds for that program, he added, are already on hand or are accruing from current operations. The additional funds will be used for projects not yet planned.

•

Manufacturers Announce Plant Expansion Plans

Westinghouse Electric Corp. directors have voted to add $5,000,000 to the $20,000,000 already appropriated for expansion of the company's new Buffalo plant. The Buffalo plant, which will house the company's motor and industrial controls divisions, was purchased from the War Assets Administration, and was formerly operated by Curtiss-Wright Corp.

Proctor Electric Co., Philadelphia, has taken a four-year lease on 44,000 additional sq. ft. of space located on the first and second floors of a four-story building at the northwest corner of Fifth and Annsbury Sts., Philadelphia.

Mica Insulator Co. has announced the establishment of new production facilities at Schenectady, N. Y., for the fabrication of mica insulation used primarily in electrical and electronic equipment. The company's engineering consultation service to assist manufacturers in problems of design involving electrical and electronic properties, or other technical questions relating to mica, is also now established at Schenectady.

Cornell-Dubilier Electric Corp., South Plainfield, N. J., will double the manufacturing capacity of its power factor division with the completion of an additional plant 41,000 sq. ft. in area, Octave Blake, president, has announced.

A construction and expansion program to cost several million dollars has been announced for the Pittsburgh Works of the Allis-Chalmers Mfg. Co., Milwaukee, by Walter Geist, president. The first major expansion of the Pittsburgh property since its purchase in 1927 by A-C will include a new 250 x 400-ft. building which will be devoted largely to production of transformers, major item manufactured by the company at Pittsburgh. Another smaller building at the New River plant will be used for shipping. According to Mr. Geist, present employment of 1,600 at Pittsburgh will be increased from one-

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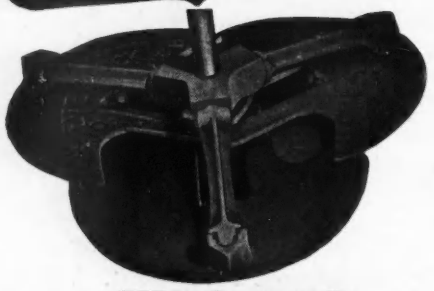

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fourth to one-third and productive capacity expanded by about 50 percent. New facilities are expected to be completed about November 1.

•

Winners of Undergraduate Welding Award Announced

Winners of the 1947 A. F. Davis Undergraduate Welding Award have been announced by the American Welding Society. John W. Price, Jr., of Rose Polytechnic Institute, Terre Haute, Ind., and Howard Sanders, of Cornell University, Ithaca, N. Y., have been selected for the $200 first prize and $150 second prize respectively.

"Atomic-Hydrogen Arc Welding" was the subject of Mr. Price's paper, published in the March, 1947, issue of the *Rose Technic*. Mr. Sanders' article, "Welders in Diving Suits," appeared in the March, 1947, issue of *The Cornell Engineer*. Each of these undergraduate magazines will also receive awards of $200 and $150, respectively, for being the publications in which the prize-winning articles were printed.

Sponsored by A. F. Davis, vice-president and secretary of the Lincoln Electric Co., the award is an annual event of the American Welding Society.

Electromaster Increases Prices on Electric Ranges

Electromaster Inc., Mount Clemens, Mich., has announced an increase of approximately 5 percent on its electric range models.

In making the announcement to distributors, Gerald Hulett, vice-president, said, "even with the increased efficiency of our new plant, our anticipated production has been retarded by material shortages. This restricted volume combined with steadily advancing costs of raw material make the adjustment in prices inevitable at this time."

The models effected were the Banquet, advanced from $214.75 to $224.50, and the popular Space Saver, from $146.90 to $154.50.

•

Philco Cancels "Class B"

Philco Corp. stockholders approved at the recent annuel meeting an amendment to the articles of incorporation to cancel 620,057 shares of class B stock which were outstanding and owned by the corporation. The outstanding capital stock now consists of 100.000 shares of 3¾ percent series A preferred and 1,372,143 common shares.

• • •

Manufacturers Issue Earnings Reports

Among the electrical manufacturing companies that have recently issued earnings reports are the following:

AMERICAN INSULATOR—For 1946, net income $172,935, compared with $78,039 earned the year before.

AMERICAN TRANSFORMER—For 1946, net loss, $77,884, before crediting $20,000 cancellation of provisions made in prior years for performance guarantee, compared with net income in 1945 of $17,539, or 32 cents a share; net sales, $2,062,353, compares with $4,912,261 including $555,036 termination claims for 1945.

CARRIER CORP.—Twelve months to April 30, net profit, after including carryback tax credits, was $1,570,336. During period completed contracts and sales amounted to $37,450,297 and orders booked totaled $46,120,124. Backlog of unfilled orders on April 30, last, was $31,932,823 against $23,255,455 a year earlier.

MAYTAG CO.—Net sales 1946 totaled $26,822,498, the largest for any year in the company's history, except 1926. They compare with sales of $12,818,816 for 1945. After providing $2,100,000 for federal income taxes, the company reported net profit of $3,027,930, the highest since 1929, and equal, after allowance for annual dividend requirements on preferred stocks, to $1.26 a share on the 1,617,921 common shares outstanding. This compares with the reported net profit for 1945 of $1,137,112, or 9 cents a share on the same number of common shares outstanding.

SYLVANIA ELECTRIC PRODUCTS INC.—Quarter ended March 31, consolidated net income $805,342, compared with a loss of $422,264 in the corresponding period of 1946. Earnings for the first quarter, after deducting dividends on the $4 cumulative preferred stock, were equal to 70 cents per share on the 1,006,550 shares of common stock outstanding. Consolidated net sales for the first quarter amounted to $23,536,779, an increase of 83 percent over the $12,834,131 volume for 1946 quarter.

ELECTRIC CONTROLLER & MANUFACTURING CO.—For 1946, net profit, $503,929, or $7.11 a share, compared with $344,020, or $4.85 a share, the preceding year.

CUTLER-HAMMER INC.—March quarter, net income $573,599, or 87 cents a capital share, compared with $112,703, or 17 cents a capital share in 1946 quarter.

ELLIOTT CO.—March quarter, net profit, $387,341, equal to $1.10 each on 328,079 common shares, contrasted with net loss of $423,673 last year. Backlog of orders on last March 31 was $26,500,000, compared with $23,200,000 at end of 1946.

LINE MATERIAL—Including subsidiaries except Canadian, March quarter, net profit, $407,072, equivalent to 84 cents each on 483,207 shares of common stock, compared with $85,021, or 18 cents a share on 459,316 shares in 1946.

WAGNER ELECTRIC—For 1946, net income, $2,583,775 or $6.60 each on 391,385 capital shares, compared with $1,054,371 earned the year before; net sales, $44,656,840, against $39,602,692.

Manufacturers Make Sales Assignments

Electrical manufacturing companies have recently made the following appointments to their sales staffs:

RAILWAY AND INDUSTRIAL ENGINEERING Co., Greensburg, Pa., has appointed Robert P. Smith of Jacksonville, Fla., as sales representative covering the states of Florida and Georgia.

PRUFCOAT LABORATORIES, INC. has appointed the United States Rubber Export Co., Ltd., as exclusive export distributors for their Prufcoat protective coatings and Pruftite transparent waterproofing.

ROEBLING'S SONS CO., Trenton, N. J., has appointed A. R. Robinson as manager of its Seattle branch. Mr. Robinson joined the Roebling company in 1936.

FEDERAL ELECTRIC PRODUCTS Co., Newark, N. J., has appointed three new district sales managers. William M. Stark becomes manager of the company's Southwestern district with headquarters in St. Louis; George L. Stout is the new manager of the East Central district with offices in Cincinnati, and Clarence G. Landeck becomes manager of the Middle Western district with headquarters in Chicago.

MINNEAPOLIS-HONEYWELL REGULATOR Co. has opened an office in Butte, Mont. Mr. Reynolds has been transferred from the company's Seattle office to serve as branch manager for the new territory.

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Ups Refrigerator Prices

Because of rising production costs, Nash-Kelvinator Corp. is increasing its refrigerator retail prices. The increases amount to $10 on five Kelvinator models and $15 on one model. Nash-Kelvinator stated that its price adjustments were made necessary by recent wage advances, equivalent to about 15 cents an hour, and by steadily rising costs of parts and materials.

•

Okonite Opens New Branch

A new sales office in Cincinnati, Ohio, has recently been established by The Okonite Co., Passaic, N. J. This branch, located at 516 Building Industries Bldg., 626 Broadway, Cincinnati 2, is in charge of S. W. Pollock, who will handle the sales of Okonite, Hazard and Okonite-Callender products in southern Ohio.

•

Anaconda Wire Dividend

Anaconda Wire & Cable Co. has authorized the payment on July 22 of a dividend of $3 a share on the common stock. In April one of 50 cents was distributed. Last year shareholders received 25 cents each in the first three quarters and a year-end of $2.25 in December.

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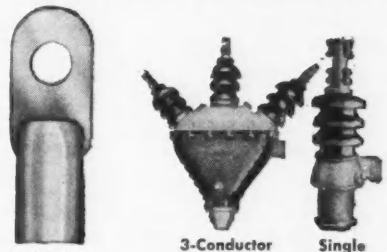

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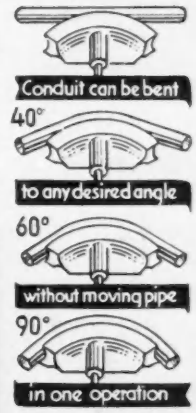

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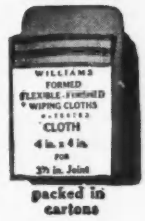

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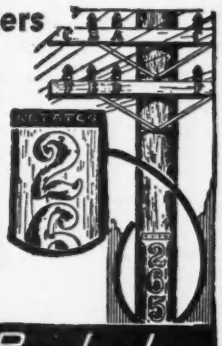

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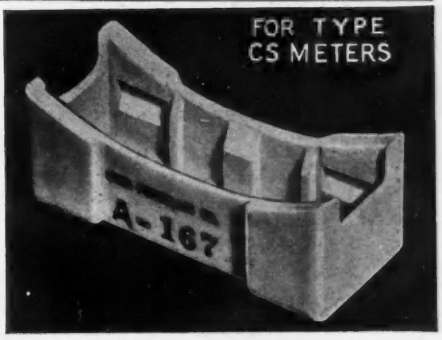

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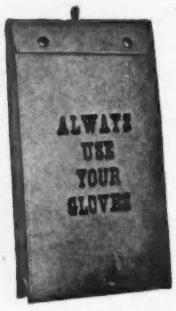

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Recent Rate Changes

BUFFALO NIAGARA ELECTRIC CORP. rate reduction estimated in the net amount of $491,400 annually, as part of a general decrease previously agreed upon, was announced by the New York Public Service Commission with the filing by the utility of revised tariffs applicable to all-purpose use and change in the fuel adjustment, effective June 20, 1947. In the latter part of 1946, following negotiations conducted by Commissioner Maurice C. Burritt, the company agreed to reduce its electric rates by approximately $1,500,000 annually. Since the first of the year the company has made two reductions totaling about $956,000, principally in the area formerly served by the Niagara Lockport & Ontario Power Co. and by the Lockport and Newfane Power & Water Supply Co., which were consolidated with Buffalo Niagara Electric Corp. in 1945. These reductions applied to residential consumers and to the all-purpose rate under which commercial and industrial consumers are served. The new revised rates complete the reductions agreed upon. Approximately 28,000 customers in the cities of Buffalo, Lackawanna, Niagara Falls, North Tonawanda, Tonawanda and adjacent territory will benefit from the new reduction.

APPALACHIAN ELECTRIC COOPERATIVE, Jefferson City, Tenn., has given 1,500 of its members a rate reduction, effective July 1, Roy S. Hendrix, manager of the cooperative, has announced. The rate reduction is in the form of removal of the amortization charge on all members of the cooperative who have received electricity for seven consecutive years. Reductions will be computed on each January 1 and July 1 after the initial reduction this month. The Tennessee Valley Authority and the Rural Electrification Administration have approved the action of the board.

CITY OF HUMBOLT (TENN.) ELECTRIC UTILITY DEPARTMENT has reduced its electric light and power rates effective July 1. The new rates are approximately 12 percent lower than the present schedule. Based on consumption of electricity as of October 31, 1946, customers will have the following savings: residential, $4,900, 12.9 percent; small lighting and power, $3,000, 12.5 percent; large lighting and power, $3,000, 9.7 percent; street lighting, $200, 7.1 percent.

SOUTH CAROLINA PUBLIC SERVICE AUTHORITY has placed in effect new schedules reducing electric power rates to large and small industrial customers in Horry and Berkeley Counties by 22 percent. The cut amounts to $20,000 a year.

LETTERS TO THE EDITOR

Motor Starting

To The Editor of ELECTRICAL WORLD:

In your April 12, 1947, issue there is an interesting article describing how an 800-hp. motor was started when the only source of power supply was three small alternators totalling 650 kw.

Mr. J. M. Evans, author of the article, discusses the possibilities of installing either a hydraulic or magnetic clutch and then goes on to say, "Capacitors were available and the expense would be less than 10 percent of either of the other two practicable methods."

This is somewhat surprising in view of the fact that the 2,115 kva. installed would involve 141 cells costing $63 each. This gives a total of $8,883. I feel quite sure that Mr. Evans could have purchased a clutch for less than ten times this amount.

W. C. King
Electric Machinery Mfg. Co.
Minneapolis, Minn.

Gigawatthours?

To The Editor of ELECTRICAL WORLD:

You may perhaps not know that more than ten years ago the A.E.F. (Ausschuss für Eienheitliche Formelgrössen) laid down rules for all exponents from 12 to −12. There was

"Tera" (greek TERAS=monster) for 10^{12}
"Giga" (greek GIGANTOS) 10^{9}
"Nano" (greek NANOS,=dwarf) 10^{-9}
"Pico" (italian PICCOLO = small) 10^{-12}

This system has been adopted almost all over German scientific publications; I think it is extremely practical. I do not know whether the international standards have accepted it, but Nano and Pico (n and p) were used in most other countries, not so much Giga and Tera.

One millimicrofarad is written one nanofarad, nF (capital F abroad).

One micromicrofarad is written one picofarad, pF.

In this system one million kilowatthours would be one Gigawatthour, expressed GWhr (here Gwhr), the next unit would be 1 TWhr = 1,000,000,000 kilowatthours.

On page 19 of the May 17 issue you would have 4.65 Twhr or 4.64 Twhr or 3.91 Twhr. The Terawatthour would be a good unit to express the output of power plants.

Of course, it has one disadvantage: it's new. Probably the A.S.A. will not accept it.

But I thought it might interest you.

Dr. George Keinath
Manual of Technical Measurements
Larchmont, N. Y.

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Solar Moves Sales Offices

Solar Manufacturing Corp. and its wholly owned subsidiary, Solar Capacitor Sales Corp. has moved its general offices to its main Eastern plant at 1445 Hudson Boulevard, North Bergen, N. J. The offices were formerly located at 285 Madison Ave., New York.